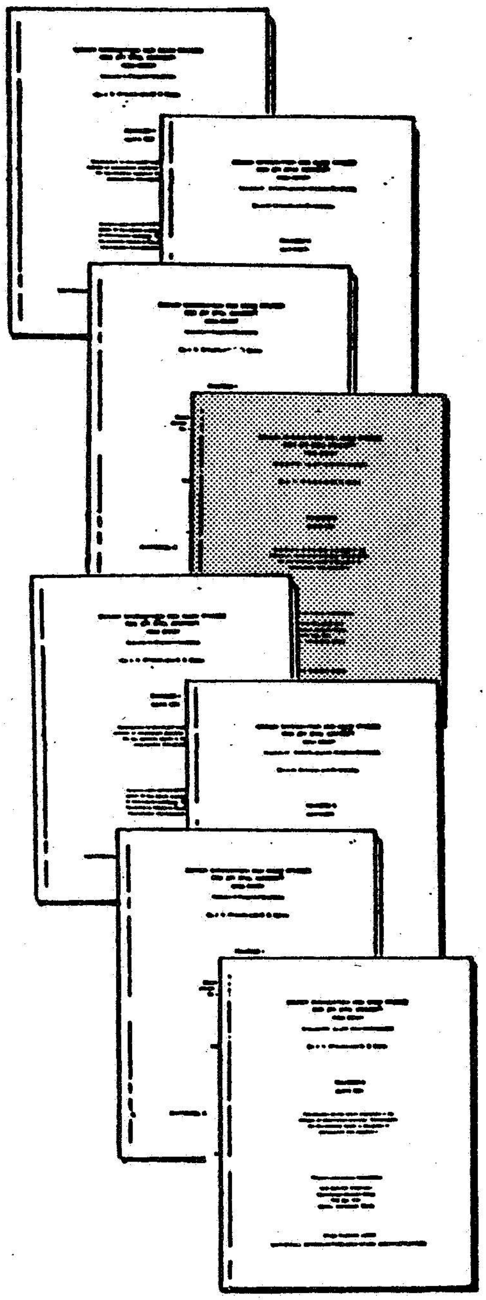
ATLAS SYSTEM DOCUMENTATION



VOLUME I
ATLAS User's Guide
NASA CR-159041

VOLUME II
System Design Document
NASA CR-159042

VOLUME III
User's Manual-Input and Execution Data
NASA CR-159043

VOLUME IV
Random Access File Catalog
NASA CR-159044

VOLUME V
System Demonstration Problems
NASA CR-159045

VOLUME VI
DESIGN Module Theory
NASA CR-159046

VOLUME VII
LOADS Module Theory
Boeing Commercial Airplane Company
D6-25400-0101

VOLUME VIII
SNARK User's Manual
Boeing Computer Services
BCS-G0686

FOREWORD

Development of the ATLAS integrated structural analysis and design system was initiated by The Boeing Commercial Airplane Company in 1969. Continued development efforts have resulted in the release and application of several extended versions of the system to aerospace and civilian structures. Those capabilities of the current ATLAS version developed under the NASA Langley Contract No. NAS1-12911 include the following: geometry control, thermal stress, fuel generation/management, payload management, loadability curve generation, flutter solution, residual flexibility, strength design of composites, thermal fully stressed design, and interactive graphics. The monitor of this contract was G. L. Giles. The inertia loading capability was developed under the Army Contract No. DAAG46-75-C-0072.

This document is one volume of a series of documents describing the ATLAS System. The remaining documents present details of the program design, the input and execution data, the engineering method used by the computational modules, and system-demonstration problems.

The key responsibilities for development of ATLAS have been within the Integrated Anlaysis/Design Systems Group of the Structures Research Unit of BCAC and the ATLAS System Group of the BCS Integrated Systems and Systems Technology Unit. R. E. Miller, Jr. was the Program Manager of ATLAS up to 1976 after which K. H. Dickenson assumed this position. The current ATLAS System is the result of the combined efforts of many Boeing engineering and programming personnel. Those who contributed directly to the current version of ATLAS are as follows:

B. F. Backman	H. B. Hansteen	C. D. Mounier
G. N. Bates	B. A. Harrison	F. D. Nelson
L. C. Carpenter	J. M. Held	M. C. Redman
R. E. Clemmons	M. Y. Hirayama	R. A. Samuel
R. L. Dreisbach	J. R. Hogley	M. Tamekuni
W. J. Erickson	H. E. Huffman	G. von Limbach
S. H. Gadre	D. W. Johnson	S. O. Wahlstrom
F. P. Gray	A. S. Kawaguchi	R. A. Woodward
D. W. Halstead		K. K. Yagi

ABSTRACT

A complete catalog is presented for the Random Access Files used by the ATLAS integrated structural analysis and design system. ATLAS consists of several technical computation modules which output data matrices to corresponding Random Access Files. A description of the matrices written on these files is contained herein.

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1.0 INTRODUCTION

ATLAS is an integrated structural analysis and design system operational on the Control Data Corporation (CDC) 6600/CYBER computers in a batch mode or in a time-shared mode via interactive text or graphic terminals. It is a modular system of computer codes with common executive and data-base mangement components. ATLAS provides an extensive set of general-purpose technical programs with aeroelastic analytical capabilities including stiffness, stress, loads, mass, substructuring, strength design, unsteady aerodynamics, vibration and flutter analyses. A finite-element structural-analysis approach is used wherein the distributed physical properties of the problem are represented by a finite number of idealized elements.

This document presents detailed descriptions of all the matrices written on the system Random Access Files. Documentation of the system architecture and user interfaces are contained in references 1-1 and 1-2.

2.0 CATALOG OF FILES AND MATRIX INDEX

NAME	TITLE	PAGE
ADDIRNF CATALOG		
XXXXX	Addint data case control matrix	10.1
XXXXXyy	Generalized airforce matrix	10.3
AF10RNF CATALOG		
ACMij	Aerodynamic control matrix	20.1
CAyijAl	Component force matrices	20.5
CGCij	Control surface geometry	20.6
CTCij	Geometry correspondence table	20.7
GF0ijAl	Generalized force matrix	20.9
M1Cij	Main surface geometry (Part 1)	20.10
M2Cij	Main surface geometry (Part 2)	20.13
SAyijAl	Sectional force matrices	20.16
SIØij	Static induction matrix	20.18
TGCij	Tab surface geometry	20.19
Wxxij	Mode shapes matrix	20.20
XMØij	Lift curve slope matrix	20.21
BUCKRNF CATALOG		
BSETCØN	Buckling set condition matrix	30.1
EIGENbs	Buckling eigenvalues	30.2
MØDESbs	Buckling eigenvectors	30.3
DATARNF CATALOG		
<u>Element key preprocessor</u>		
ADATDIR	ATLAS data directory	50.1
<u>AF1 preprocessor</u>		
AFCCi	AF1 control surface correspondence matrix	50.3
AFCFi	AF1 direct modification data	50.4
AFCGi	AF1 control surface geometry	50.6
AFCSi	AF1 control matrix	50.8
AFDMi	AF1 M0 modification data	50.10
AFMCi	AF1 modal control	50.11
AFMGi	AF1 main surface geometry	50.13

NAME	TITLE	PAGE
AFPMi	AF1 sectional pitching moment distributions	50.15
AFRBi	AF1 rigid body modes	50.17
AFSLi	AF1 sectional lift data	50.18
AFTCi	AF1 tab surface correspondence matrix	50.20
AFTGi	AF1 tab geometry	50.21
AFURi	AF1 unit rotation modes	50.23
AFYGi	AF1 strip geometry	50.25
Machbox preprocessor		
BØXi	Planform geometry data	50.26
Dublat-lattice preprocessor		
DLBGi	Body interference surface geometry	50.33
DLCSi	Control and size matrix	50.35
DLDIi	Body doublet geometry matrix	50.37
DLMCi	Modal control matrix	50.39
DLPGi	Lifting surface geometry matrix	50.41
DLPIi	Pressure scaling data	50.43
DLRBi	Rigid body modes matrix	50.45
DLSSi	Subset data matrix	50.46
DLVIi	Velocity profile data	50.48
Geometry preprocessor		
GCØMPID	Component ID matrix	50.50
GDEF001	Geometry component data	50.51
Detail geometry preprocessor		
GKD001a	Spacing matrix	50.52
GKE001a	Spacing lower bounds matrix	50.54
GKF001a	Spacing upper bounds matrix	50.56
GKS001a	Cross section matrix	50.58
GKT001a	Cross section lower bounds matrix	50.60
GKU001a	Cross section upper bounds matrix	50.62
Interact preprocessor		
IACVsss	Assembly control vector	50.64
IDLCsss	Downward loadcase runcode matrix	50.65
IELCsss	Loadcase expansion runcode matrix	50.66

NAME	TITLE	PAGE
IFAVsss	Freedom activity vector	50.67
ILCLsss	Loadcase correspondence table	50.68
ILCØsss	Loadcase correspondence table without text string	50.69
ILDØsss	Loadcase downward order vector	50.70
ILFAsss	Loads freedom activity vector	50.71
ILØCsss	Local coordinate systems matrix	50.72
ILRCsss	Reduced loads runcode matrix	50.73
INC1sss	Nodal correspondence table	50.74
INDMsss	Nodal data matrix	50.76
IRFVsss	Retained freedom vector	50.77
ISPNsss	Sorting pointer matrix	50.78
ISRCsss	Reduced stiffness runcode matrix	50.79
ISRTsss	Substructure sorting matrix	50.80
ISSCsss	Substructure definition vector	50.81
ISSSCØR	Set/stage--substructure correspondence vector	50.82
ITRBsss	Substructure traceback matrix	50.84
IUFRsss	User freedom reference table	50.85

Element key preprocessor

KELEKEY	Element key matrix	50.87

Material preprocessor

KMATERA	Material code matrix	50.104
KM00001	Material data matrices	50.105
KCMSUMM	Composite material matrix	50.107

Stiffness preprocessor

KECØMAa	Flexible element control matrix	50.109
KEPCVRa	Element property code matrices	50.110
KEPCVIa	Element property code matrices	50.110
KEPCVUa	Element property code matrices	50.110
KINPCSa	Nodal input coordinate system	50.111
KLCT00a	Flexible element correspondence table	50.112
KLØCØØa	Local coordinate system matrix	50.113
KMELNØa	Flexible element nodal matrix	50.114
KNC100a	Nodal correspondence table	50.116
KNDCØNa	Nodal connectivity matrix	50.118
KNØ001a	Element nodal data matrix	50.120

NAME	TITLE	PAGE
KNØALTa	Nodal data matrix	50.122
KPARMS1	Parameter matrix	50.123
KPRØPSa	Property data matrix	50.125
KSF001a	Flexible element data matrices	50.127

Boundary condition preprocessor

NAME	TITLE	PAGE
KACV0ba	Assembly control vector	50.131
KCØØRba	Loadcase correspondence table	50.132
KD001ba	Specified displacement matrix	50.133
KRFV0ba	Retained freedom vector	50.134
KUFRT0a	User freedom reference table	50.135

Loads preprocessor

NAME	TITLE	PAGE
LCØMBba	Combined loadcase matrix	50.137
LCØØRba	Loadcase correspondence table	50.138
LD001ba	Specified displacement matrices	50.139
LE001ba	Specified load matrices	50.140
LEDIRba	Element load direction matrix	50.141
LLCØØba	Loadcase correspondence table (without text string)	50.142
LN001ba	Direct nodal loads matrices	50.143
LNTLTba	Nodal thermal load index table	50.144
LRØTNba	Rotational inertia loads matrix	50.145
LT001ba	Nodal thermal load matrices	50.146
LTLCCba	Thermal loadcase correspondence table	50.147
LU001ba	Element thermal loads matrix	50.148
LUX01ba	Element thermal load correspondence	50.149

Mass preprocessor

NAME	TITLE	PAGE
MCMASga	Concentrated mass data matrix	50.150
MCMNØDa	Unique concentrated mass nodes	50.151
MCØNDTa	Condition data matrix	50.152
MFATUDa	Fuel condition attitude matrix	50.153
MFCØNDa	Fuel condition data matrix	50.154
MFLØADa	Fuel management loading matrix	50.155
MFMUSEa	Fuel management usage matrix	50.157
MFULffa	Fuel element data matrices	50.177
MHØLDSa	Cargo hold geometry matrix	50.159
MLABELa	Weight statement label data	50.161
MLCT00a	Mass element correspondence table	50.162
MLØDppa	Payload element data matrices	50.177
MLUMP0a	Mass lumping data	50.163

NAME	TITLE	PAGE
MMELNØa	Mass element nodal matrix	50.164
MPANLha	Auxiliary panel data matrix	50.166
MPARMS1	Mass module control data	50.167
MPCØNDa	Payload conditions matrix	50.169
MPLØADa	Payload loading data	50.170
MPLØCLa	Seat location-local coordinate systems matrix	50.172
MPNØCTa	Seat location correspondence table	50.173
MPNØDLa	Seat location data matrix	50.175
MPSETha	Mass panel subset matrix	50.176
MSF001a	Mass element data matrices	50.177
MTANKSa	Fuel tank data matrix	50.180
MWTFACa	Element weight factors	50.182
MWTFTta	Weight factor table matrix	50.183

Design preprocessor

NALLØWC	Compression allowables table	50.185
NALLØWS	Shear allowables table	50.187
NBI001a	Buckling interaction data matrix	50.189
NBUCTAB	Buckling tables index matrix	50.190
NC001ba	Design load control matrices	50.191
ND001ba	Temperature data control matrix	50.192
NDLCRba	Design loadcase matrix	50.193
NEMØDUL	Elasticity modulus table	50.195
NGMØDUL	Shear modulus table	50.197
NITYPEa	Element types and partitions	50.199
NKS001a	Element control matrices	50.201
NL001ba	Design loads matrices	50.202
NMATERa	Material code reference matrix	50.204
NMØDTAB	Modulus tables index matrix	50.205
NMS001a	Margin of safety matrices	50.206
NØCNTRa	Optimization control matrix	50.208
NØDVCCa	Variable constants control matrix	50.209
NØD001a	Optimization data matrix	50.210
NPARAMa	Parameter matrix	50.212
NPB001a	Bound data matrices	50.213
NPD001a	Design data matrices	50.215
NSMCNTa	Smoothing property control matrix	50.217
NSMKEYa	Smoothing problem key matrix	50.219
NSP001a	Smoothing property data matrix	50.221
NST001a	Restrain sizing matrix	50.222
NT001ba	Temperature data matrices	50.223
NTLCRba	Thermal design load case matrix	50.225
NVARIAa	Variable constraints data matrix	50.227

NAME	TITLE	PAGE
RHO3 preprocessor		
R30i000	RHØ3 case data matrix	50.228
RCmi000	Cubic hinge rotation matrices	50.236
Subset definition preprocessor		
SEKddda	Stiffness element subset matrix	50.237
SEMddda	Mass element subset matrix	50.237
SGKddda	Stiffness ordered element subset	50.238
SGMddda	Mass ordered element subset	50.238
SNKddda	Stiffness node subset matrix	50.239
SPKddda	Ordered nodal subset matrix	50.240
Stress preprocessor		
SUDISba	Superposition displacement constraints	50.241
SULCTba	Superposition loadcase labels	50.243
SUPERba	Superposition stage data	50.244
SUPSTGa	Superposition stage table	50.246
SUSTRba	Superposition stress constraints	50.247
Flutter preprocessor		
ULCSi	Flutter data matrix	50.249

DESIRNF CATALOG

DESPARa	History parameter matrix	60.1
HISTRYa	History min. margin of safety matrix	60.2
M001cba	Strength min. margin of safety matrices	60.3
MIN01ca	Resize min. margin of safety matrices	60.4
MPARcba	Strength parameter matrix for output margins of safety	60.5
MPØ001a	Pointer matrix for minimum margins of safety	60.6
MTARcba	Thermal design parameter matrix for output margins of safety	60.7
N001cba	Thermal design minimum margins of safety matrix	60.8
S001cba	Strength margin of safety matrix	60.9

NAME	TITLE	PAGE
SMIMcba	Strength margins of safety matrix	60.10
T001cba	Thermal design margin of safety matrix	60.12
TMIMcba	Thermal MIN-MAX margins of safety matrix	60.13

DUBLRNF CATALOG

ACMij00	Dublat control matrix	70.1
B1Cij00	Box geometry matrix (part I)	70.4
B2Cij00	Box geometry matrix (part II)	70.6
DBCij00	Body doublet matrix	70.8
GF0ijkl	Generalized forces matrix	70.10
M1Øij00	1/4 chord displacement matrix	70.11
M3Øij00	3/4 chord displacements and slopes	70.12
PDØijkl	Pressure difference matrices	70.13
PSCij00	Pressure scaling matrix	70.14
Q00xxkl	Quasi-inverse matrix (0-partition)	70.16
Qzzxxkl	Quasi-inverse matrix (lower/upper partitions)	70.17
SBCij00	Strip/box correspondence table matrix	70.18
SDØijkl	Stability derivatives matrix	70.20
SFBijkl	Body sectional forces matrix	70.21
SFØijkl	Surface sectional forces matrix	70.22
SGCij00	Strip geometry matrix	70.23
VPCij00	Velocity profile matrix	70.25

EXTRRNF CATALØG

DBEXTNM	Extract name list matrix	80.1
DBINDEX	Data base index name matrix	80.2
DBEXCØN	Extract control matrix	80.3
DB001rr	Extracted data matrices	80.7
DBINDrr	Extracted data key index matrix	80.8
****LST	Subset namelist matrices	80.9
**NMxxx	Subset matrices	80.10
SITM001	Label subset matrix	80.12
SPKddda	Boundary defintion subset matrix	80.13

FLEXRNF CATALØG

xxxxx	Flexair data case control matrix	90.1
xxxxxyy	Generalized airforce matrix	90.3

NAME	TITLE	PAGE
FLUTRNF CATALOG		
Fiupvjw	Eigensolution data matrix	100.1
FLBCij	Output control data matrix	100.3
FPiupvj	Plot control matrix	100.4
FPiupvjx	Plot data matrix	100.6
FRiupvj	Output print data matrix	100.7
INTERNF CATALOG		
Cddd	Interpolation coefficient matrices	110.1
INTABLE	Interpolation table	110.15
LOADRNF CATALOG		
DA001ba	Specified displacement matrices	120.1
DCØØRba	Load case correspondence table	120.2
EL001ba	Element temperature matrix	120.3
ELCØNba	Element temperature control	120.5
IB001ba	Composite element initial stress matrix	120.6
IBC01ba	Composite element initial stress control matrix	120.7
IS001ba	Initial stress matrices	120.8
ISC01ba	Initial stress control matrices	120.9
LA001ba	Nodal loads matrices	120.10
LFAV0ba	Loads freedom activity vector	120.11
RSULTba	Applied loads resultant matrix	120.12
MACHRNF CATALOG		
ACMij	Aerodynamic control matrix	130.1
ACNijkl	AIC names matrix	130.3
AICCeee	Velocity potential AIC matrix	130.4
AICINDX	AIC index matrix	130.5
AICMeee	AIC pointer matrix	130.7
AICPeee	Planar AIC matrix	130.8
AICVeee	Sidewash AIC matrix	130.10
AICWeee	Upwash AIC matrix	130.11
BLnijkl	Box lift matrix	130.12
BØXijkT	Noncoplanar-tail box code matrix	130.13
BØXijkW	Wing box code matrix	130.14
CMnijkl	Sectional moment matrix	130.15
DWPijkl	Normal wash pointer matrix	130.16

NAME	TITLE	PAGE
EXPij	Machbox execution parameter matrix	130.17
GACijkl	Real generalized aerodynamic coefficient matrix	130.28
GCIijkl	Imaginary generalized aerodynamic coefficient matrix	130.29
GF0ijkl	Generalized force matrix	130.30
ISPijk	Mode shape printing pointer matrix	130.31
LNnijkl	Wing or wing/tail lower surface normal wash matrix	130.32
LTnijkl	Non-coplanar tail lower surface normal wash matrix	130.33
MØnijkl	Mode shapes matrix	130.34
MPTijk	Planform pointer matrix	130.35
PCnijkl	Pressure difference coefficients matrix	130.36
PSTijkl	Tail subdivided normal wash pointer matrix	130.37
PSWijkl	Wing subdivided normal wash pointer matrix	130.38
SACijkl	Smoothed real generalized aerodynamic coefficient matrix	130.39
SBnijkl	Smoothed box lift matrix	130.40
SCIijkl	Smoothed imaginary generalized aerodynamic coefficient matrix	130.41
SF0ijkl	Smoothed generalized force matrix	130.42
SLnijkl	Sectional lifts matrix	130.43
SMnijkl	Smoothed sectional moment matrix	130.44
SPnijkl	Smoothed pressure difference coefficients matrix	130.45
SSnijkl	Smoothed sectional lifts matrix	130.46
STnijkl	Tail subdivided normal wash matrix	130.47
SUnijkl	Wing subdivided normal wash matrix	130.48
SVnijkl	Smoothed velocity potential matrix	130.49
UNnijkl	Wing upper surface normal wash matrix	130.50
UTnijkl	Tail upper surface normal wash matrix	130.51
VPnijkl	Velocity potential matrix	130.52
WSnijkl	Off-planform wash sample matrix	130.53

MASSRNF CATALOG

Cg0001a	Concentrated mass data matrices	140.1
CVECppa	Cargo vector	140.3
FTtt01a	Fuel tables	140.4
FTINDXa	Fuel table index matrix	140.5

NAME	TITLE	PAGE
FVECffa	Fuel vector	140.3
GFff01a	Fuel element geometry data	140.9
GK0001a	Stiffness element geometry data	140.6
GM0001a	Mass element geometry data	140.6
GPpp01a	Payload element geometry data	140.9
IDXFffa	Fuel element index matrix	140.12
IDXK00a	Stiffness element index matrix	140.10
IDXM00a	Mass element index matrix	140.10
IDXPppa	Payload element index matrix	140.12
MA0001a	Element mass matrices	140.14
MDCqqqa	Mass/panel weight matrices	140.16
MFAV00a	Mass freedom activity vector	140.20
MFff01a	Fuel element mass data	140.21
MK0001a	Stiffness element mass data	140.21
MM0001a	Mass element mass data	140.21
MPpp01a	Payload element mass data	140.21
MREDsss	Substructure mass matrices	140.22
PVECppa	Passenger vector	140.3
TAPLWTa	Condition summary matrix	140.23
TØTLWTa	Data subset total mass properties matrix	140.24

MERGRNF CATALOG

IFATsss	Substructure freedom assignment table	150.1
KFAT0ba	Freedom assignment table	150.3
KRTC0ba	Retained freedom correspondence table	150.5
KUFRT0a	User freedom reference table	150.6

RHØ3RNF CATALOG

ACMij00	RHØ3 condition control matrix	170.1
CM00000	C-matrix index table	170.3
CMi0000	C-matrix	170.5
DW0ijkl	Full downwash matrix	170.6
DWMijkl	Modified downwash matrix	170.7
GF0ijkl	Generalized forces	170.8
HCmij00	Cubic hinge rotation coefficients	170.9

NAME	TITLE	PAGE
MØ0ij00	Modal slopes and deflections	170.10
PR0ijkl	Unsteady pressure report	170.11
PS0ijkl	Pressure series coefficients	170.12
R30ij00	RHØ3 data case matrix	170.13
SFmijkl	Sectional generalized forces	170.21
STIFRNF CATALOG		
GFAV01s	Freedom activity vector-geometric stiffness	180.1
GP0001a	Element stress matrices	180.2
KA0001a	Element stiffness matrices	180.4
KG0001s	Element geometric stiffness matrix	180.6
KFAV01a	Freedom activity vector	180.8
STRERNF CATALOG		
B0001ba	Brick nodal stress matrix	190.1
DCNTRba	Displacement control matrix	190.3
DCØØRba	Loadcase correspondence table	190.4
DI001ba	Displacement matrices	190.5
FCNTRba	Force control matrix	190.7
FØ001ba	Element force matrix	190.8
KECØMAa	Flexible element control matrix	190.9
KSF001a	Flexible element matrices	190.10
SCN01ba	Stress control matrix	190.14
SELSITa	Stress element sorting index table	190.15
SLCSTba	Stress loadcase specification table	190.16
ST001ba	Stress matrices	190.17
SUELCTa	Stress user element correspondence table	190.18
SUPERba	Superposition stage data	190.19
UD001ba	Displacement matrix (user order)	190.21
UDC01ba	Nodal displacement control matrix (user order)	190.22
UF001ba	Element force matrix (user order)	190.23
UFC01ba	Force control matrix (user order)	190.24
US001ba	Stress matrices (user order)	190.25
USC01ba	Stress control matrix (user order)	190.26

NAME	TITLE	PAGE
VIBRRNF CATALOG		
FREQSvs	Vibration eigenvalues	200.1
GMASSvs	Generalized mass	200.2
GSTIFvs	Generalized stiffness	200.3
MØDESvs	Vibration eigenvectors	200.4
SFdddvs	Subset freedom and node numbers	200.5
SMdddvs	Subset mode shapes	200.6
TØTWTvs	Total mass matrix	200.7
VSETCØN	Vibration set condition matrix	200.8

3.0 NOMENCLATURE

The descriptions in this document contain seven blocks of information for each matrix. These are:

File:	This defines the name of the ATLAS random access file on which the matrix resides.
Index Name:	The matrix index names used in this catalog are shown as a combination of capital and lower case characters. The characters that are capitalized are fixed, whereas, the lower case characters are variable and are defined below.
a	Display code equivalent of the data set number
b	Display code equivalent of the boundary condition stage number
bs	Buckling set number
c	Display code equivalent of the design cycle number
ddd	Subset number
eee	Number of the AICINDX entry for the corresponding AIC matrix
ff	Mass fuel condition number
g	Concentrated mass subset number
h	Mass auxiliary panel subset number
i	Display code equivalent of the aerodynamic case number
j	Display code equivalent of the aerodynamic condition number
k	Display code equivalent of the Mach number index
l	Display code equivalent of the K-value index
m	Display code equivalent of the control surface number

n	Display code equivalent of the mode shape number
p	Display code equivalent of the retention vector set number
pp	Mass payload condition number
qqq	Mass condition number
rr	Sequential extract number
s	Display code equivalent of the buckling set number
sss	Substructure number
t	Weight factor table identification
tt	Fuel tank attitude number
u	Display code equivalent of the flutter change set number
v	Display code equivalent of the flutter altitude identifier
vs	Vibration set number
w	Display code equivalent of the flutter record number
xxxx	One to seven user specified characters
y	Display code equivalent of the partition number for the matrices on AF10RNF
yy	Display code equivalent of the output K-value index
zz	Display code equivalent of the partition number for the matrices on DUBLRNF
001,002	Matrix block numbers

Following the index name, certain matrices which contain analysis data describing the overall problem are identified as user matrices. The format of these matrices and the user matrices residing on the CHOLRNF, MERGRNF, and MULTRNF random access files are described in reference 1.1.

Type: This represents the SNARK matrix type, REAL, MIXED, NULL, or DIAGONAL.

Dimensions: The row and column dimensions ar each matrix are defined here.

Auxiliary ID: This block of information defines the ten words of auxiliary ID stored within the SNARK header. The contents described represent the data stored by the various preprocessors and processors. In addition, when a matrix is saved on the ATLAS save files, the random access file name is stored in Word 1 and the matrix index name is stored in Word 2.

Elements: The contents and format of each data matrix are defined within this block of information.

Generation: This specifies which routine or module generates the described matrix.

ADDINT DATA CASE CONTROL MATRIX

File:	ADDIRNF	
Index Name:	xxxxx	
Type:	MIXED	
Dimensions:	(NOUTK+12)*1 where NOUTK is the number of output generalized air force matrices (the number of output K-values)	
Auxiliary ID:	Word 1:	ADDIRNF
	Word 2:	Matrix index name
	Word 3:	MACH, Mach number
	Word 4:	BREF, Reference length for the reduced frequency
	Words 5-10:	Zero
Elements:	Items 1-6 each contain 2 packed 30 bit integers defined as follows:	
Item 1:	Bits 59-30:	The number of constants (2)
	Bits 29-0:	Pointer to the row containing the first constant (7)
Item 2:	Bits 59-30:	The number of output K-values (NOUTK)
	Bits 29-0:	Pointer to the row containing the first K-value (13)
Item 3:	Bits 59-30:	The number of Mach numbers (1)
	Bits 29-0:	Pointer to the row containing the Mach number (9)
Item 4:	Bits 59-30:	The number of problem size numbers (1)
	Bits 29-0:	Pointer to the row containing the problem size number (10)

Item 5:	Bits 59-30:	The number of matrix size numbers (1)
	Bits 29-0:	Pointer to the row containing the matrix size number (11)
Item 6:	Bits 59-30:	The number of altitudes (1)
	Bits 29-0:	Pointer to the row containing the altitude (12)
Item 7:	BREF, Reference length for the reduced frequency	
Item 8:	SPAN/2	
Item 9:	MACH, the Mach number	
Item 10:	NMODES, the number of modes	
Item 11:	2*NMODES*NMODES, the size of the generalized air force matrices	
Item 12:	ALT, the altitude or 10HNO ALT	
	Items 13 - (NOUTK+12) contain the NOUTK output K-values for which generalized air forces are prepared.	

<u>Generation</u>: Program RSPW, RCCIW, or RMW of the ADDINT processor.

GENERALIZED AIR FORCE MATRIX

File:	ADDIRNF
Index Name:	xxxxxyy
Type:	REAL
Dimensions:	(2*NMODES)*NMODES (NMODES*NMODES complex) where NMODES is the number of mode shapes.
Auxiliary ID:	Word 1: ADDIRNF Word 2: Matrix index name Word 3: MACH, mach number Word 4: BREF, Reference length for the reduced frequency Words 5-10: Zero
Elements:	Element (i,j) is the work done by the motion of the surface in the i-th mode acting against the unsteady aerodynamic pressure in the j-th mode divided by $-\omega^2\rho$ where ρ is the density of the air and ω is the circular frequency of oscillation.
Generation:	Program RSPW, RCCIW, or RMW of the ADDINT processor.

AERODYNAMIC CONTROL MATRIX

File:	AF10RNF	
Index Name:	ACMij	
Type:	MIXED	
Dimensions:	(60+NKVALS)*1	
Auxiliary ID:	Word 1:	AF10RNF
	Word 2:	ACMij
	Words 3-10:	Zero

Elements:

Item 1:	Bits 59-30:	Number of constants (8)
	Bits 29-0:	Location of the first constant (6)
Item 2:	Bits 59-30:	Number of reduced frequencies (NKVAL)
	Bits 29-0:	Location of the first reduced frequency (NKPTR)
Item 3:	Zero	
Item 4:	Bits 59-30:	Number of problem size indicators
	Bits 29-0:	Location of the first problem size indicator (NNSPTR)
Item 5:	Bits 59-30:	Number of matrix size indicators
	Bits 29-0:	Location of the first matrix size indicator (NMSPTR)
Item 6:	Reference Length	
Item 7:	Case Number	
Item 8:	Condition Number	
Item 9:	Geometric symmetry option (SYMMETRIC, ANTISYM, NONSYMM)	

Item 10:	Two dimensional analysis option (TWOD, NONE)
Item 11:	MOPT option (MOPT, NONE)
Item 12:	Quasi Steady Option (QS, NONE)
Item 13:	Checkprint Option (CHKOPT, NONE)
Item 14:	Revised test symmetry option (SYMMETRIC, ANTISYM, NONSYMM, INDEFINITE)
Item NNSPTR:	Number of modes
Item NNSPTR+1:	Number of main surfaces
Item NNSPTR+2:	Number of control surfaces
Item NNSPTR+3:	Number of tabs
Item NNSPTR+4:	Total number of strips
Item NNSPTR+5:	Number of rigid body modes
Item NNSPTR+6:	Number of elastic modes
Item NNSPTR+7:	Number of unit rotation modes
Item NNSPTR+8:	Number of reduced frequencies
Item NNSPTR+9:	Maximum number of modes in a partition
Item NNSPTR+10:	Number of antisymmetric test cases
Item NNSPTR+11:	Number of nonsymmetric test cases
Item NNSPTR+12:	Number of symmetric test cases
Item NMSPTR:	Length of main surface geometry array
Item NMSPTR+1:	Length of control surface geometry array
Item NMSPTR+2:	Length of tab geometry array
Item NMSPTR+3:	Length of strip data array
Item NMSPTR+4:	Length of control surface control data array

Item NMSPTR+5:	Length of tab control data array
Item NMSPTR+6:	Length of AFCCi array
Item NMSPTR+7:	Length of AFTCi array
Item NMSPTR+8:	Length of AFCSi array
Item NMSPTR+9:	Length of the largest modal interpolation coefficient array
Item NMSPTR+10:	Length of rigid body modes array
Item NMSPTR+11:	Length of unit rotation modes array
Item NMSPTR+12:	Length of AFCFi array
Item NMSPTR+13:	Length of indirect data array
Item NMSPTR+14:	Length of AFPMi array
Item NMSPTR+15:	Length of control array
Item NMSPTR+16:	Length of M1Cij array
Item NMSPTR+17:	Length of M2Cij array
Item NMSPTR+18:	Length of CGCij array
Item NMSPTR+19:	Length of TGCij array
Item NMSPTR+20:	Length of CTCij array
Item NMSPTR+21:	Length of normal wash array
Item NMSPTR+22:	Length of static induction array
Item NMSPTR+23:	Length of the component force arrays
Item NMSPTR+24:	Length of the sectional lift arrays
Item NMSPTR+25:	Zero
Item NMSPTR+26:	Length of the generalized forces array
Item NMSPTR+27:	Length of the MCM array

Item NMSPTR+28: Length of the induced normal wash array

Item NMSPTR+29: Length of the C(k) array

Item NMSPTR+30: Length of the input MD array

Generation: Program AFGEOM of the AF1 processor.

COMPONENT FORCE MATRICES

File: AF10RNF

Index Name: CAyijAl
CByijAl
CCyijAl
CDyijAl
CEyijAl

Type: REAL

Dimensions: K12 * NUMMOD * NMOD where:

K12 = 1 if the component matrix is real
2 if the component matrix is complex

NUMMOD = number of modal coordinates used to calculate the generalized airforces

NMOD = number of modes in the partition.

Auxiliary ID:

Word 1:	AF10RNF
Word 2:	The matrix index name
Word 3:	Reduced frequency value
Word 4:	Reference length
Words 5-10:	Zero

Elements: The items of these matrices (real or complex) represent the forces on mode i due to oscillatory displacements in mode j.

CAyijAl: noncirculatory aerodynamic stiffness (Real)

CByijAl: noncirculatory aerodynamic damping (Real)

CCyijAl: noncirculatory aerodynamic inertia (Real)

CDyijAl: circulatory aerodynamic stiffness (Real or complex)

CEyijAl: circulatory aerodynamic damping (Real or complex)

Generation Program AFGAF of the AF1 processor.

CONTROL SURFACE GEOMETRY

File: AF10RNF

Index Name: CGCij

Type: MIXED

Dimensions: 1*N where N = 3*NUMMSS + 3
NUMMSS = Number of strips

Auxiliary ID:

Word 1:	AF10RNF
Word 2:	CGCij
Words 3-10:	Zero

Elements:

Item 1:	Bits 59-30:	Number of strips
	Bits 29-0:	Location of control surface hinge line x-coordinate for first strip
Item 2:	Bits 59-30:	Number of strips
	Bits 29-0:	Location of y-coordinate of strip center line for first strip
Item 3:	Bits 59-30:	Number of strips
	Bits 29-0:	Location of z-coordinate of strip center line for first strip.

Items 4 to NUMMSS + 3:

x-coordinate of control surface hinge line at each strip centerline

Items NUMMSS+4 to 2*NUMMSS+3:

Y-coordinate of strip centerline for each strip

Items 2*NUMMSS+4 to 3*NUMMSS+3:

z-coordinate of strip centerline for each strip

Generation: Program AFGEOM of the AF1 processor.

GEOMETRY CORRESPONDENCE TABLE

File:	AF10RNF	
Index Name:	CTCij	
Type:	MIXED	
Dimensions:	1 * (NUMCT + NUMMS + NUMCS + NUMTS + 4), where	
	NUMCT = Number of strips NUMMS = Number of main surfaces NUMCS = Number of control surfaces NUMTS = Number of tabs	
Auxiliary ID:	Word 1:	AF10RNF
	Word 2:	CTCij
	Words 3-10:	Zero

Elements:

Item 1:	Bits 59-30:	Number of elements in the correspondence table (NUMCT)
	Bits 29-0:	Location of first element in the correspondence table (CTPTR)
Item 2:	Bits 59-30:	Number of main surface names (NUMMS)
	Bits 29-0:	Location of first main surface name (MSPTR)
Item 3:	Bits 59-30:	Number of control surface names (NUMCS)
	Bits 29-0:	Location of first control surface name (CSPTR)
Item 4:	Bits 59-30:	Number of tab names (NUMTS)
	Bits 29-0:	Location of first tab name (TSPTR)

Items CTPTR to (CTPTR + NUMCT -1):

Surfaces intersected by each strip.

Bits 59-45: Zero

Bits 44-30: Main surface index

Bits 29-15: Control surface index

Bits 14-0: Tab index

Items MSPTR to (MSPTR + NUMMS - 1):

Main surface identification

Bits 59-30: Main surface name

Bits 29-15: Index of the first strip on the surface

Bits 14-0; Index of the last strip on the surface

Items CSPTR to (CSPTR + NUMCS - 1):

Control surface identification

Bits 59-30: Control surface name

Bits 29-15: Index of the first strip on the surface

Bits 14-0: Index of the last strip on the surface

Items TSPTR to (TSPTR + NUMTS - 1):

Tab identification

Bits 59-30: Tab name

Bits 29-15: Index of the first strip on the tab

Bits 14-0: Index of the last strip on the tab

<u>Generation</u>: Program AFGEOM of the AF1 processor.

GENERALIZED FORCE MATRIX

File: AF10RNF

Index Name: GF0ijA1

Type: REAL

Dimensions: K12 * NUMMOD * NUMMOD, where:

K12 = 1 for Quasi-steady airforces
2 for Unsteady airforces

NUMMOD = Number of modal coordinates

Auxiliary ID:

Word 1:	AF10RNF
Word 2:	GF0ijA1
Word 3:	Reduced Frequency
Word 4:	Reference length
Words 5-10:	Zero

Elements: A real array for quasi-steady airforces, or element pairs forming a complex array for unsteady airforces. The (i,j) term represents the force on the ith modal coordinate due to a unit amplitude oscillatory displacement of the jth coordinate.

Generation: Program AFGAF of the AF1 processor.

MAIN SURFACE GEOMETRY (PART 1)

File:	AF10RNF	
Index Name:	M1Cij	
Type:	MIXED	
Dimensions:	8 + (NUMMSS * 8) where:	
	NUMMSS = number of strips	
Auxiliary ID:	Word 1:	AF10RNF
	Word 2:	M1Cij
	Words 3-10:	Zero

Elements:

Item 1:	Bits 59-30:	Number of dihedral angles (NUMMSS)
	Bits 29-0:	The location of the first dihedral angle (GAMPTR)
Item 2:	Bits 59-30:	Number of quarter chord x-coordinates, (NUMMSS)
	Bits 29-0:	Location of the first quarter chord x-coordinate (X25PTR)
Item 3:	Bits 59-30:	Number of three quarter chord x-coordinates (NUMMSS)
	Bits 29-0:	Location of the first three quarter x-coordinate (X75PTR)
Item 4:	Bits 59-30:	Number of strip centerline y-coordinates, (NUMMSS)
	Bits 29-0:	Location of the first strip centerline y-coordinate (YCLPTR)
Item 5:	Bits 59-30:	Number of strip centerline z-coordinates (NUMMSS)
	Bits 29-0:	Location of the first strip centerline z-coordinate (ZCLPTR)

Item 6: Bits 59-30: Number of strip widths (NUMMSS)

Bits 29-0: Location of the first strip width (DYPTR)

Item 7: Bits 59-30: Number of elastic axis x-coordinates (NUMMSS)

Bits 29-0: Location of the first elastic axis x-coordinate (XEAPTR)

Item 8: Bits 59-30: Number of strips (NUMMSS)

Bits 29-0: Location of the "2D Static Induction" for the first strip. (DSIPTR)

Items GAMPTR to (GAMPTR + NUMMSS - 1):

Dihedral angle of each strip

Items X25PTR to (X25PTR + NUMMSS - 1):

x - coordinate of the interection of the quarter chord and the centerline of each strip.

Items X75PTR to (X75PTR + NUMMSS - 1):

x - coordinate of the interaction of the three quarter chord and the centerline of each strip.

Items YCLPTR to (YCLPTR + NUMMSS - 1):

y - coordinate of each strip centerline

Items ZCLPTR to (ZCLPTR + NUMMSS - 1):

z - coordinate of each strip centerline

Items DYPTR to (DYPTR + NUMMSS - 1):

Width of each strip

Items XEAPTR to (XEAPTR + NUMMSS - 1):

x - coordinate of the intersection of the elastic axis and the centerline of each strip.

Items DSIPTR to (DSIPTR + NUMMSS - 1):

[1/4*chord*cosine (sweep angle)] for each strip

<u>Generation</u>: Program AFGEOM of the AF1 processor.

MAIN SURFACE GEOMETRY (PART 2)

File:	AF10RNF	
Index Name:	M2Cij	
Type:	MIXED	
Dimensions:	(N*NUMMSS + 8) where:	
	NUMMSS = number of strips N = number of arrays present	
Auxiliary ID:	Word 1: Word 2: Words 3-10:	AF10RNF M2Cij Zero

Elements:

Item 1:	Bits 59-30:	Number of elements in the A-array (NUMA = NUMMSS)
	Bits 29-0:	Location of A for the first strip (APTR)
Item 2:	Bits 59-30:	Number of strips
	Bits 29-0:	Location of first strip semichord (SPTR)
Item 3:	Bits 59-30:	Number of elements in the C-array (NUMC = NUMMSS or 0)
	Bits 29-0:	Location of C for the first strip (CPTR)
Item 4:	Bits 59-30:	Number of elements in the D-array (NUMD = NUMMSS or 0)
	Bits 29-0:	Location of D for the first strip (DPTR)

Item 5:	Bits 59-30:	Number of elements in the L-array (NUML = NUMMSS or 0)
	Bits 29-0:	Location of L for the first strip (LPTR)
Item 6:	Bits 59-30:	Number of elements in the M-array (NUMM = NUMMSS or 0)
	Bits 29-0:	Location of M for the first strip (MPTR)
Item 7:	Bits 59-30:	Number of strips
	Bits 29-0:	Location of the first strip width (DYPTR)
Item 8:	Bits 59-30:	Number of strips
	Bits 29-0:	Location of the y - coordinate of the first strip centerline. (YCLPTR)
Item 9:	Bits 59-30:	Number of strips
	Bits 29-0:	Location of the first strip dihedral angle (GAMPTR)

Items APTR to (APTR + NUMMSS - 1):

The distance along the strip centerline from the midchord to the elastic axis as a fraction of semichord for each strip

Items BPTR to (BPTR + NUMMSS - 1):

The semichord of each strip

Items CPTR to (CPTR + NUMC - 1):

The distance along the strip centerline from the midchord to the control surface hinge line

Items DPTR to (DPTR + NUMD - 1):

The distance along the strip centerline from the midchord to the tab hinge line as a fraction of semichord for each strip.

Items LPTR to (LPTR + NUML - 1):

The distance along the strip centerline from the control surface leading edge to its hinge line as a fraction of semichord for each strip

Items MPTR to (MPTR + NUMM - 1):

The distance along the strip centerline from the tab leading edge to its hinge line as a fraction of semichord for each strip

Items DYPTR to (DYPTR + NUMMSS - 1):

The width of each strip

Items YCLPTR to (YCLPTR + NUMMSS - 1):

y - coordinate for each strip

Items GAMPTR to (GAMPTR + NUMMSS - 1):

The dihedral of each strip

<u>Generation</u>: Program AFGEOM of the AF1 processor.

SECTIONAL FORCE MATRICES

File:	AF10RNF
Index Name:	SAyijAl SByijAl SCyijAl SDyijAl SEyijAl
Type:	REAL
Dimensions:	(K12 * NUMMSS*NS) * NMOD where:

K12 = 1 if the matrix is real
2 if the matrix is complex

NUMMSS = Number of strips

NS = 2 if no control surfaces or tabs are present

NS = 3 if control surfaces only are present

NS = 4 if control surfaces and tabs are present

NMOD = Number of modal coordinates in this partition.

Auxiliary ID:

Word 1:	AF10RNF
Word 2:	The matrix indix name
Word 3:	Reduced frequency
Word 4:	Reference length
Words 5-10:	Zero

Elements: The items of these matrices represent the elements of a real array or element pairs forming a complex array representing the force and moment about the reference axis, control surface and tab hinge lines on strip i due to unit oscillatory displacements of modal coordinate j.

SAyijAl: noncirculatory aerodynamic stiffness (Real)

SByijAl: noncirculatory aerodynamic damping (Real)

SCyijAl: noncirculatory aerodynamic inertia (Real)

SDyijAl: circulatory aerodynamic stiffness (Real or Complex)

SEyijAl: circulatory aerodynamic damping (Real or Complex)

Generation: Program AFGAF of the AF1 processor.

STATIC INDUCTION MATRIX

File:	AF10RNF
Index Name:	SIØij
Type:	REAL
Dimensions:	NUMMSS * NUMMSS where: NUMMSS = Number of strips
Auxiliary ID:	Word 1: AF10RNF Word 2: SIØij Words 3-10: Zero
Elements:	This matrix contains the elements of the static induction matrix
Generation:	Program AFSI of the AF1 processor.

TAB SURFACE GEOMETRY

File: AF10RNF

Index Name: TGCij

Type: MIXED

Dimensions: 1*N where N = 3* NUMMSS + 3
NUMMSS = Number of strips

Auxiliary ID:

Word 1:	AF10RNF
Word 2:	TGCij
Words 3-10:	Zero

Elements:

Item 1:	Bits 59-30:	Number of strips
	Bits 29-0:	Location of tab surface hinge line x-coordinate for first strip
Item 2:	Bits 59-30:	Number of strips
	Bits 29-0:	Location of y-coordinate of strip center line for first strip
Item 3:	Bits 59-30:	Number of strips
	Bits 29-0:	Location of z-coordinate of strip center line for first strip.

Items 4 to NUMMSS + 3:

x-coordinate of tab surface hinge line at each strip centerline

Items NUMMSS+4 to 2*NUMMSS+3:

y-coordinate of strip centerline for each strip

Items 2*NUMMSS+4 to 3*NUMMSS+3:

z-coordinate of strip centerline for each strip

Generation: Program AFGEOM of the AF1 processor.

MODE SHAPES MATRIX

File: AF10RNF

Index Name: Wxxij

Type: REAL

Dimensions: (N * NUMMSS) * NMOD, where:

NMOD = Number of modes in this partition

NUMMSS = Number of strips

N = 2 if no control surfaces nor tabs are used
3 if no tabs are used
4 if control surfaces and tabs are used

Auxiliary ID:
Word 1: AF10RNF
Word 2: Wxxij
Words 3-10: Zero

Elements: Rows 1-NUMMSS contain the elastic axis displacements.

Rows (NUMMSS+1)-(2*NUMMSS) contain the elastic axis rotations.

Rows (2*NUMMSS+1)-(3+NUMMSS) contain the control surface relative rotations if N equals 3 or 4.

Rows (3*NUMMSS+1)-(4*NUMMSS) contain the tab relative rotations if N equals 4.

Generation: Program AFMODE of the AF1 processor.

LIFT CURVE SLOPE MATRIX

File: AF10RNF

Index Name: XMØij

Type: REAL

Dimensions: (NUMMSS + 1) where:

NUMMSS = Number of strips.

Auxiliary ID:

Word 1:	AF10RNF
Word 2:	XMØij
Words 3-10:	Zero

Elements:

Item 1:

Bits 59-30:	NUMMSS
Bits 29-0:	Location of the first lift curve slope (MOPTR)

Items 2 to (NUMMSS+1):

Values of the lift curve slope for each strip.

Generation: Program AFGAF of the AF1 processor.

BUCKLING SET CONDITION MATRIX

File: BUCKRNF

Index Name: BSETCØN

Type: MIXED

Dimensions: NBSET * 2, where NBSET is the maximum number of buckling sets defined.

Auxiliary ID:

Word 1:	BUCKRNF
Word 2:	BSETCØN
Word 3-10:	Zero

Elements: Row i contains the data corresponding to buckling set number i.

Item 1: The stiffness matrix name.

Item 2: The geometric stiffness matrix name.

Generation: Program PICKUP of the buckling (vibration) processor.

BUCKLING EIGENVALUES

File:	BUCKRNF	
Index Name:	EIGENbs (user matrix).	
Type:	MIXED	
Dimensions:	(NF*3)*1, where NF equals the number of requested eigenvalues.	
Matrix Name:	Word 1:	Date of matrix generation (month/day/year)
	Word 2:	Geometric stiffness matrix name
	Word 3:	Stiffness matrix name
	Word 4:	Eigenvalue matrix name
	Word 5:	Generalized mass matrix name
	Word 6:	Generalized stiffness matrix name
Auxiliary ID:	Word 1:	BUCKRNF
	Word 2:	EIGENbs
	Word 3:	Type of dynamic matrix operated on. = 1 - stiffness = 2 - Flexibility = 3 - Buckling
	Words 4-10:	Zero
Elements:	The eigenvalues are stored in a row-wise, lower triangular format. (Sparse format, no leading zeros)	
Generation:	Program EXPAND of the buckling (vibration) processor.	

BUCKLING EIGENVECTORS (MODE SHAPES)

File: BUCKRNF

Index Name: MØDESbs (user matrix).

Type: REAL

Dimensions: N*M where N equals the dimension of the stiffness matrix (number of retained degrees of freedom) and M equals the number of requested mode shapes.

Matrix Name:

Word 1:	Date of matrix generation (month/day/year)
Word 2:	Geometric stiffness matrix name
Word 3:	Stiffness matrix name
Word 4:	Eigenvalue matrix name
Word 5:	Generalized mass matrix name
Word 6:	Generalized stiffness matrix name

Auxiliary ID:

Word 1:	BUCKRNF
Word 2:	MØDESbs
Word 3:	Number of selected rigid body modes (NFAC)
Word 4-9:	Normalizing value for Ith rigid body mode (I=1, NFAC)
Word 10:	Zero

Elements: Item (i,j) contains the normalized eigenvalue of the i-th freedom for the j-th mode.

Generation: Program EQCHECK of the buckling (vibration) processor.

CHØLRNF

(Only user matrices as described in reference 1-1 are written on CHØLRNF)

ATLAS DATA DIRECTORY

File:	DATARNF	
Index Name:	ADATDIR	
Type:	MIXED	
Dimensions:	405 * 2	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	ADATDIR
	Words 3-10:	Zero

Elements:

Row i, column 1 contains the name of the ith label in the ATLAS Data Directory, in left justified, zero filled format. The names are sorted alphabetically.

Row i, column 2 contains a code word associated with the ith label as follows:

Bits 59-42:	Eighteen bits (left to right) representing up to 18 attributes. A bit is on if that particular attribute is related to the label.
Bits 41-36:	Element type to which the label is related. This is the standard ATLAS element number. Element number zero signifies nodes.
Bits 35-33:	Code number. (ref. 1-1)
Bits 32-27:	Sequence number. This is the sequence number for the label from amongst the labels that have identical element type and code. (ref. 1-1)

Bits 26-21:	Matrix group number. This indicates to the Extract processor the incoming ATLAS matrix in which the value of the label resides. The matrix group number and the matrix name correspondence is built into the extract processor.
Bits 20-0:	Zero

<u>Generation</u>: Program ELKEYPR of the elementkey preprocessor.

AF1 CONTROL SURFACE CORRESPONDENCE MATRIX

File: DATARNF

Index Name: AFCCi

Type: MIXED

Dimensions: $1*(\sum_{i=1}^{NMS} (NCS(i) + 2))$ where:

NMS = Number of main surfaces that have control surfaces.

NCS(i) = Number of control surfaces on main surface i.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	AFCCi
Words 3-10:	Zero

Elements:

Item 1:

Bits 59-30: Name of first main surface that has a control surface.

Bits 29-0: Location of the next main surface name.

Item 2:

Bits 59-30: Number of control surfaces on this main surface.

Bits 29-0: Location of the first control surface name. (CSPTR)

Items CSPTR to (CSPTR + NCS(i)-1):

The names of the control surfaces associated with this main surface.

These items are repeated as required to define the correspondence between main surfaces and control surfaces.

Generation: Program INPAF1 of the AF1 preprocessor

AF1 DIRECT MODIFICATION DATA

File: DATARNF

Index Name: AFCFi

Type: MIXED

Dimensions: $1*(17 + NUMALP + \sum_{i=1}^{16} NUMI(i))$ where:

NUMALP = Number of modifier values

NUMI(i) = Number of instructions associated with the ith partition.

Auxiliary ID:

Word 1: DATARNF
Word 2: AFCFi
Words 3-10: Zero

Elements:

Items 1-16: Control information for each of the sixteen partitions of the oscillatory derivative matrix:

Bits 59-30: Number of instructions for this partition.

Bits 29-0: Location of first instruction for this partition. (0 if no instruction) (PTR(i))

Item 17: Bits 59-30: NUMALP

Bits 29-0: Location of the first modifier value. (ALPPTR)

Items ALPPTR to (ALPPTR + NUMALP-1):

The values of the modifiers.

The remaining items are repeated for each partition of the oscillatory derivative matrix that has modifying instructions associated with it.

Items PTR(i) to (PTR(i +1)-1:

Bits 59-57:	Reserved
Bits 56-51:	Partition number
Bits 50-42:	First element of the partition to be modified.
Bits 41-33:	Last element of the partition to be modified.
Bits 32-30:	Modifier code, 0 for scale, 1 for replace.
Bits 29-0:	Index of the first modifier to be used in this instruction.

Generation: Program INPAF1 of the AF1 preprocessor

AF1 CONTROL SURFACE GEOMETRY

File: DATARNF

Index Name: AFCGi

Type: MIXED

Dimensions: $1*(\sum_{i=1}^{NCS} (7 + 3*(NUMLEP(i) + NUMHLP(i)))$ where:

NCS	=	Number of control surfaces
NUMLEP(i)	=	Number of leading edge definition points for the ith control surface
NUMHLP(i)	=	Number of hinge line definition points for the ith control surface.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	AFCGi
Words 3-10:	Zero

Elements: The following items are repeated for each control surface.

Item 1:	Bits 59-30:	Control surface name.
	Bits 29-0:	Location of the next control surface name (0 if last control surface)
Items 2-4:	Bits 59-30:	NUMLEP(i)
	Bits 29-0:	Location of the first leading edge x, y and z coordinates (LEPTR)
Items 5-7:	Bits 59-30:	NUMHLP(i)
	Bits 29-0:	Location of the first hinge line x, y and z coordinates (HLPTR)

Items LEPTR to (LEPTR + 3*NUMLEP(i)-1):

The leading edge x-coordinates followed by the y-coordinates and the z-coordinates.

Items HLPTR to (HLPTR + 3* NUMHLP-1):

The hinge line x-coordinates followed by the y-coordinates and the z-coordinates.

Generation: Program INPAF1 of the AF1 preprocessor

AF1 CONTROL MATRIX

File:	DATARNF	
Index Name:	AFCSi	
Type:	MIXED	
Dimensions:	1 * 44	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	AFCSi
	Words 3-10:	Zero

Elements: This matrix contains the active contents of common block CONTRL, arrays NSIZE and MSIZE.

Item 1:	Bits 59-30:	Number of active items in NSIZE (13)
	Bits 29-0:	Location of NSIZE
Item 2:	Bits 59-30:	Number of active items in MSIZE (29)
	Bits 29-0:	Location of MSIZE

Items 3 to 15 are the first 13 items in NSIZE.

Item 3:	Zero
Item 4:	Number of main surfaces.
Item 5:	Number of control surfaces.
Item 6:	Number of tabs.
Item 7:	Number of strips.
Item 8:	Number of rigid body modes.
Item 9:	Zero
Item 10:	Number of unit rotation modes.
Item 11:	Zero
Item 12:	Zero

Item 13: Number of antisymmetric test cases.

Item 14: Number of nonsymmetric test cases.

Item 15: Number of symmetric test cases.

Item 16 to 44 are the first 29 items in MSIZE.

Item 16: Length of matrix AFMGi

Item 17: Length of matrix AFCGi.

Item 18: Length of matrix AFTGi.

Item 19: Length of matrix AFYGi.

Item 20: Length of matrix AFCCi.

Item 21: Length of matrix AFTCi.

Item 22: Length of matrix AFCSi.

Item 23: Length of matrix AFMCi.

Item 24: Length of matrix AFRBi.

Item 25: Length of matrix AFURi.

Item 26: Length of matrix AFCFi.

Item 27: Length of matrix AFSLi.

Item 28: Length of matrix AFPMi.

Item 29-40: Zero

Item 41: Length of matrix MCM.

Item 42-43: Zero

Item 44: Length of matrix AFDMO.

Generation: Program INPAF1 of the AF1 preprocessor

AF1 M0 MODIFICATION DATA

File: DATARNF

Index Name: AFDMi

Type: MIXED

Dimensions: $1 * (\sum_{i=1}^{ND} 3 + 2 * MNO(i))$ where:

ND = Number of surfaces for which M0 data is available.

NMO(i) = Number of M0 values for surface i.

Auxiliary ID:

Word 1: DATARNF
Word 2: AFDMi
Words 3-10: Zero

Elements: The following items are repeated for each surface with which M0 modification data is associated.

Item 1:
- Bits 59-30: Name of the surface.
- Bits 29-0: Location of the next surface name. (0 if last surface)

Item 2:
- Bits 59-30: Number of eta stations (NMO(i)).
- Bits 29-0: Location of the first eta station (ETAPTR).

Item 3:
- Bits 59-30: Number of M0s (NMO(i)).
- Bits 29-0: Location of the first M0 (MOPTR).

Items ETAPRT to (ETAPRT + NMO(i)-1):

Eta stations.

Items MOPTR to (MOPTR + NMO(i)-1):

M0 values.

Generation: Program INPAF1 of the AF1 preprocessor

AF1 MODAL CONTROL

File:	DATARNF	
Index Name:	AFMCi	
Type:	MIXED	
Dimensions:	4 + NUMID + NUMMM + NUMCM + NUMTM where:	
	NUMID =	Number of interpolation coefficient matrices.
	NUMMM =	Number of main surfaces with coefficients.
	NUMCM =	Number of control surfaces with coefficients.
	NUMTM =	Number of tabs with coefficients.
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	AFMCi
	Words 3-10:	Zero

Elements:

Item 1:	Bits 59-30:	NUMID
	Bits 29-0:	Location of the first interpolation coefficient name. (IDPTR)
Item 2:	Bits 59-30:	NUMMM
	Bits 29-0:	Location of the first main surface name. (MMPTR)
Item 3:	Bits 59-30:	NUMCM
	Bits 29-0:	Location of the first control surface name. (CMPTR)
Item 4:	Bits 59-30:	NUMTM
	Bits 29-0:	Location of the first tab name (TMPTR)

Items IDPTR to (IDPTR+NUMID-1):

Interpolation coefficient matrix names.

Items MMPTR to (MMPTR+NUMMM-1):

Bits 59-48: Reserved

Bits 47-39: Integer 1.

Bits 38-30: Index of associated interpolation coefficients.

Bits 29-0: Main surface name.

Items CMPTR to (CMPTR + NUMMCM - 1):

Bits 59-48: Reserved

Bits 47-39: Integer 2.

Bits 38-30: Index of associated interpolation coefficients.

Bits 29-0: Control surface name.

Items TMPTR to (TMPTR + NUMTM - 1):

Bits 59-48: Reserved

Bits 47-39: Integer 3.

Bits 38-30: Index of associated interpolation coefficients.

Bits 29-0: Tab name.

Generation: Program INPAF1 of the AF1 preprocessor

AF1 MAIN SURFACE GEOMETRY

File: DATARNF

Index Name: AFMGi

Type: MIXED

Dimensions: $1*(\sum_{i=1}^{NMS} (11+3*(NUMLEP(i)+NUMTEP(i)+NUMEAP(i)))$

where:

NMS	=	Number of main surfaces.
NUMLEP	=	Number of leading edge points.
NUMTEP	=	Number of trailing edge points.
NUMEAP	=	Number of elastic axis points.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	AFMGi
Words 3-10:	Zero

Elements: The following items are repeated for each main surface represented in the analysis.

Item 1:	Bits 59-30:	Name of the main surface.
	Bits 29-0:	Location of the next main surface name (0 if last surface)
Items 2-4:	Bits 59-30:	NUMLEP(i)
	Bits 29-0:	Location of the first leading edge x, y and z coordinates (LEPTR).
Items 5-7:	Bits 59-30:	NUMTEP(i)
	Bits 29-0:	Location of the first trailing edge z, y and z coordinates (TEPTR).
Items 8-10:	Bits 59-30:	NUMEAP(i)
	Bits 29-0:	Location of the first elastic axis x, y and z coordinates (EAPTR).

Items LEPTR to (LEPTR + 3*NUMLEP(i)-1):

The leading edge x-coordinates followed by the y-coordinates and the z-coordinates.

Item TEPTR to (TEPTR + 3* NUMTEP(i)-1):

The trailing edge x-coordinates followed by the y-coordinates and the z-coordinates.

Item EAPTR to (EAPTR + 3* NUMEA(i)-1):

The elastic axis x-coordinates followed by the y-coordinates and the z-coordinates.

<u>Generation</u>: Program INPAF1 of the AF1 preprocessor

AF1 SECTIONAL PITCHING MOMENT DISTRIBUTIONS

File: DATARNF

Index Name: AFPMi

Type: MIXED

Dimensions: $1 * \left(\sum_{i=1}^{NS} (3 + 2*NUMETA(i)) \right)$ where:

NS	=	Number of surfaces with pitching moment data.
NUMETA(i)	=	Number of pitching moment values for surface i.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	AFPMi
Words 3-10:	Zero

Elements: The following group of items is repeated for each surface.

Item 1:	Bits 59-30:	Name of the surface.
	Bits 29-0:	Location of the next surface name. (0 if last surface).
Item 2:	Bits 59-30:	NUMETA(i).
	Bits 29-0:	Location of the first eta value. (ETAPTR)
Item 3:	Bits 59-30:	NUMETA(i)
	Bits 29-0:	Location of the first pitching moment. (PMPTR)

Items ETAPTR to (ETAPTR + NUMETA(i)-1):

The eta stations for which pitching moments are defined.

Items PMPTR to (PMPTR+NUMETA(i)-1):

The pitching moments.

<u>Generation</u>: Program INPAF1 of the AF1 preprocessor

AF1 RIGID BODY MODES

File: DATARNF

Index Name: AFRBi

Type: MIXED

Dimensions: 1*(10+6* NUMRBM) where:

NUMRBM = Number of rigid body modes.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	AFRBi
Words 3-10:	Zero

Elements:

Item 1: Length of the array.

Item 2: 8HMOTIONPT

Item 3: Zero

Item 4: NUMRBM

Item 5: 1.0

Item 6: NUMRBM

Item 7-9: x, y and z coordinates of the reference point.

Items 10-(6*NUMRBM-1):

The rigid body translations in the GLØBAL x, y and z directions followed by the GLØBAL x, y, and z rotations. These items are repeated for each rigid body mode.

Item 10 + 6* NUMRBM:

8HMOTIONPT

Generation: Program INPAF1 of the AF1 preprocessor

AF1 SECTIONAL LIFT DATA

File: DATARNF

Index Name: AFSLi

Type: MIXED

Dimensions: $1*\left(\sum_{i=1}^{NT} \left(5 + \sum_{j=1}^{NS(i)} (3+NUMETA(i,j)\right)\right)$ where:

NT = Number of tests.

NS(i) = Number of surfaces contributing to test i.

NUMETA(i,j) = Number of eta stations for surface j in test i.

Auxiliary ID:

Word 1: DATARNF
Word 2: AFSLi
Words 3-10: Zero

Elements: The following group of items is repeated for each test.

Item 1: Bits 59-30: Name of the test.

Bits 29-0: Location of the next test name. (0 if last test)

Item 2: Bits 59-30: Number of surfaces to be modified.

Bits 29-0: Location of the first surface to be modified.

Item 3: Location of the first surface name. (SIPTR)

Item 4: Test rotation axis dihedral.

Item 5: Test rotation angle.

The following items of this group are repeated for each surface that contributes data to this test.

Item SIPTR: Bits 59-30: Name of the surface.

Bits 29-0: Location of the next surface. (0 if last surface)

Item SIPTR+1:

Bits 59-30: NUMETA(i,j)

Bits 29-0: Location of the first eta value (ETAPTR)

Item SIPTR+2:

Bits 59-30: NUMETA(i,j)

Bits 29-0: Location of the first lift value (LPTR)

Items ETAPTR to (ETAPTR + NUMETA(i,j)-1):

Eta stations for which lift values are available.

Item LPTR to (LPTR + NUMETA(i,j)-1):

Lift at the associated eta station.

Generation: Program INPAF1 of the AF1 preprocessor

AF1 TAB SURFACE CORRESPONDENCE MATRIX

File: DATARNF

Index Name: AFTCi

Type: MIXED

Dimensions: $1*(\sum_{i=1}^{NCS} (NT(i)+2))$ where:

NCS = Number of control surfaces that have tabs.

NT(i) = Number of tabs on control surface i.

Auxiliary ID:

Word 1: DATARNF
Word 2: AFTCi
Words 3-10: Zero

Elements: The following group of items is repeated for each control surface that has a tab

Item 1:

Bits 59-30: Name of the first control surface that has a tab

Bits 29-0: Location of the next control surface name. (0 if last control surface)

Item 2:

Bits 59-30: Number of tabs on this control surface. (NTS(i))

Bits 29-0: Location of the first tab name.

Items 3 to (NTS(i)+2):

The names of the tabs associated with this control surface.

These items are repeated as required to define the correspondence between control surfaces and tabs.

Generation: Program INPAF1 of the AF1 preprocessor

AF1 TAB GEOMETRY

File: DATARNF

Index Name: AFTGi

Type: MIXED

Dimensions: $1*(\sum_{i=1}^{NTS} (7+3*(NUMLEP(i) + NUMHP(i)))$ where:

NTS	=	Number of tabs.
NUMLEP(i)	=	Number of leading edge points for the ith tab.
NUMHLP(i)	=	Number of hinge line points for the ith tab.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	AFTGi
Words 3-10:	Zero

Elements: The following group of items is repeated for each tab.

Item 1:	Bits 59-30:	Tab name.
	Bits 29-0:	Location of the next tab name (0 if last tab)
Item 2-4:	Bits 59-30:	NUMLEP(i)
	Bits 29-0:	Location of the first leading edge x, y and z coordinate (LEPTR)
Item 5-7:	Bits 59-30:	NUMHLP(i)
	Bits 29-0:	Location of the first hinge line x, y and z coordinate (HLPTR)

Items LEPTR to (LEPTR+3*NUMLEP(i)-1):

The leading edge x-coordinates followed by the y coordinates and the z coordinates.

Items HLPTR to (HLPTR+3*NUMHLP(i)-1):

The hinge line x-coordinates followed by the y coordinates and the z coordinates.

<u>Generation</u>: Program INPAF1 of the AF1 preprocessor

AF1 UNIT ROTATION MODES

File:	DATARNF	
Index Name:	AFURi	
Type:	MIXED	
Dimensions:	1*(2*NUMUI + NUMRY) where:	
	NUMUI = Number of unit rotation instructions.	
	NUMRY = Number of unit rotations.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	AFURi
	Words 3-10:	Zero

Elements:

Item 1:	Bits 59-30:	NUMRY
	Bits 29-0:	Location of the first unit rotation (RYPTR)
Item 2:	Bits 59-30:	NUMUI
	Bits 29-0:	Location of the first unit rotation instruction (UIPTR)

Items RYPTR to (RYPTR + NUMTR - 1):

Array of unit rotations.

Items UIPTR to (UIPTR + NUMUI - 1):

Bits 59-57:	Reserved
Bits 56-48:	Mode number
Bits 47-39:	2 for a control surface. 3 for a tab.

Bits 38-30: Location of the unit rotation.

Bits 29-0: Name of the surface.

Generation: Program INPAF1 of the AF1 preprocessor

AF1 STRIP GEOMETRY

File: DATARNF

Index Name: AFYGi

Type: MIXED

Dimensions: $1*(\sum_{i=1}^{NMS} (2+NUMYC))$ where:

NMS = Number of main surfaces.

NUMYC = Number of strip edges.

Auxiliary ID:

Word 1: DATARNF
Word 2: AFYGi
Words 3-10: Zero

Elements: The following group of items is repeated for each main surface.

Item 1:

Bits 59-30: Name of the surface.

Bits 29-0: Location of the next surface name. (0 if last surface)

Item 2:

Bits 59-30: NUMYC

Bits 29-0: Location of the first strip value (YCPTR)

Items YCPTR to (YCPTR + NUMYC - 1):

The distance from the strip edges to the root of the main surface.

Generation: Program INPAF1 of the AF1 preprocessor

MACHBOX PLANFORM GEOMETRY DATA

<u>File Name</u>: DATARNF

<u>Index Name</u>: BØXi

<u>Type</u>: MIXED

<u>Dimensions</u>: 1 x 1223

<u>Auxiliary ID</u>.

Word 1:	DATARNF
Word 2:	BØXi
Words 3-5:	Zero
Word 6:	Semi-span (maximum spanwise dimension of surface 1)
Word 7:	Zero
Word 8:	Case number
Words 9-10:	Zero

<u>Elements</u>: This array contains all the planform geometry data needed by the MACHBOX technical module.

The elements are listed in the order they are defined in the labelled common blocks of the MACHBOX technical module.

Items 1-10 are from labelled common /MATRNAM/.

Item 1-10: TITLE(ID) - 10 words containing data case title in Hollerith format

Items 11-32 are from labelled common /GEOMTY/.

Item 11: COPLAN - logical indication for coplanar surfaces

.T. surfaces are coplanar

.F. two surfaces do not have the same dihedral angle or only one surface is defined

Item 12: NSUBDV - the number of subdivided rows (columns) per box

Item 13:	XSUBDV	-	Float (NSUBDV)
Item 14:	NSUBD2	-	NSUBDV/2
Item 15:	NSUBCN	-	NSUBD2 + 1 center y location of first chord
Item 16:	NSURF	-	number of surfaces
Item 17:	B1	-	box length
Item 18:	B1BETA	-	box width
Item 19:	B1S	-	subdivided box length=B1/XSUBDV
Item 20:	B1BTAS	-	subdivided box width =B1BETA/XSUBDV
Item 21:	WLAX	-	global x coordinate of the wing local axis location
Item 22:	WLAZ	-	global z coordinate of the wing local axis location
Item 23:	PSIW	-	dihedral angle of first surface, input in degrees but converted to radians
Item 24:	MXBW	-	number of rows to aftmost portion of the first surface
Item 25:	MXBBW	-	number of rows to aftmost first surface diaphragm box
Item 26:	MYBW	-	number of chords on the first surface (NCHRDS)
Item 27:	MYBBW	-	number of first surface chords including tip diphragm
Item 28:	MXBSW	-	subdivided MXBW count
Item 29:	MYBSW	-	subdivided MYBW count
Item 30:	MYBBSW	-	subdivided MYBBW count

Item 31:	IXBW	-	subdivided grid x-location of the first unsubdivided box center of the first surface
Item 32:	XCENTR	-	x-location of the center of the first box on the first surface

Items 33-44 are from labelled common /GEOM2/.

Item 33:	TLAX	-	global x coordinate of the second surface local axis location
Item 34:	TLAZ	-	global z coordinate of the second surface local axis location
Item 35:	PSIT	-	dihedral angle of second surface input in degrees but converted to radians
Item 36:	MXBT	-	number of rows to aftmost portion of second surface
Item 37:	MYBT	-	number of chords on the second surface
Item 38:	MYBBT	-	number of second surface chords including tip diaphragm
Item 39:	MXBST	-	subdivided MXBT count
Item 40:	MYBST	-	subdivided MYBT count
Item 41:	MYBBST	-	subdivided MYBBT count
Item 42:	IXBT	-	subdivided grid x location of the first unsubdivided box center of the second surface
Item 43:	IXBST	-	subdivided grid x location of the first subdivided box of the second surface
Item 44:	CAPL	-	non-dimensionalized vertical distance between centerlines of the first and second surfaces

Items 45-128 are from labelled common /PLANXY/.

Item 45:	NWLE	-	number of first surface leading edge definition points
Item 46:	NWTE	-	number of first surface trailing edge definition points
Item 47:	NTLE	-	number of second surface leading edge definition points
Item 48:	NTTE	-	number of second surface trailing edge definition points
Item 49-58:	XWLE	-	first surface leading edge definition points (x locations)
Item 59-68:	YWLE	-	first surface leading edge definition points (y locations)
Item 69-78:	XWTE	-	first surface trailing edge definition points (x locations)
Item 79-88:	YWTE	-	first surface trailing edge definition points (y locations)
Item 89-98:	XTLE	-	second surface leading edge definition points (x locations)
Item 99-108:	YTLE	-	second surface leading edge definition points (y locations)
Item 109-118:	XTTE	-	second surface trailing edge definition points (x locations)
Item 119-128:	YTTE	-	second surface tailing edge definition points (y locations)

Items 129-153 are from labelled common /ARRAYS/.

Item 129:	KBXCDW	-	reserved for future use
Item 130:	LBXCDW	-	row dimension of wing box code array
Item 131:	LBOXC	-	column dimension of wing box code array

Item 132:	KBXCDT	-	reserved for future use
Item 133:	LBXCDT	-	row dimension of tail box code array
Item 134:	KJALPH	-	reserved for future use
Item 135:	LJALPH	-	length of IJALPH array
Item 136:	KALPHA	-	reserved for future use
Item 137:	KKERNL	-	reserved for future use
Item 138:	LKERNL	-	length of SKERNL array
Item 139:	KPNTRM	-	reserved for future use
Item 140:	LPNTRM	-	length of planform pointer array
Item 141:	KDEFSL	-	reserved for future use
Item 142:	KELPHI	-	reserved for future use
Item 143:	LMODES	-	length of complex velocity potential array
Item 144:	KPNTSP	-	reserved for future use
Item 145:	LPNTSP	-	column dimension of the subdivided normal wash points array
Item 146:	KSDW	-	reserved for future use
Item 147:	LSDW	-	column dimension of the subdivided normal wash array
Item 148:	KPNTDW	-	reserved for future use
Item 149:	LPNTDW	-	column dimension of the normal wash pointer array
Item 150:	KDW	-	reserved for future use
Item 151:	LDW	-	length of the upper surface and lower surface normal wash arrays
Item 152:	KTVP	-	reserved for future use

Item 153:	LTVP	-	length of the leading and trailing edge pointer arrays and of the trailing edge velocity potential array

Items 154-194 are from labelled common /SAMPLW/.

Item 154:	ISMPLW	-	number of chords specified for wash sampling
Item 155-164:	ICHORD(10)	-	chord number for sampling
Item 165-174:	IBOXF(10)	-	first box on chord to be sampled
Item 175-184:	IBOXL(10)	-	last box on chord to be sampled
Item 185-194:	ZLOC(10)	-	Z-location of sampling chord, internally to correspond to wing coordinates

Items 195-217 are from labelled common /MODES/.

Item 195:	NAME1	-	the name of the interpolation coefficient array to be used with surface 1
Item 196:	NAME2	-	same as above for surface 2
Item 197: Item 198: Item 199:	RBX RBY RBZ	-	global coordinates of rigid body reference point
Item 200-211:	RBDEL(2,6)	-	array of rigid body keywords and displacement magnitudes
Item 212:	FMOD1	-	the first mode shape of first surface interpolation information array to be used
Item 213:	FMOD2	-	the first mode shape of second surface interpolation information array to be used
Item 214:	LMOD1	-	the last mode shape of first surface interpolation information array to be used

Item 215: LMOD2 - the last mode shape of second surface interpolation information array to be used

Item 216: NMODES: - the total number of modes from first surface interpolation information array to be used

Item 217: NMODE2 - The total number of modes from second surface interpolation information array to be used, NMODES must equal NMODE2

Items 218 and 219 are from labelled common /BOX/.

Item 218: NCHRDS - the number of chords to be used in the analysis

Item 219: XEDGE - the local coordinate x location of the leading edge of a planform box

Items 220-1223 are from labelled common /TSLOPE/.

Item 220: NTSS1 - number of thickness slopes, input for surface 1

Item 221: NTSS2 - number of thickness slopes, input for surface 2

Item 222: TSMN1 - Mach number for which surface 1 thickness slopes are to be used

Item 223: TSMN2 - Mach number for which surface 2 thickness slopes are to be used

Items 224-1223: TS - Array of thickness slopes

Generation: Program PREMACH of the machbox preprocessor

DUBLAT BODY INTERFERENCE SURFACE GEOMETRY

File: DATARNF

Index Name: DLBGi

Type: MIXED

Dimensions: $(\text{NUMBOD} + \text{NUMPD} * 12 + \sum_{i=1}^{\text{NUMBP}} (\text{NUMCD}_i + \text{NUMSD}_i)) * 1$

Where:

NUMBOD = Number of interference bodies
NUMBP = Number of interference body panels
NUMCD = Number of chordwise divisions on the i-th panel
NUMSD = Number of spanwise divisions on the i-th panel

Auxiliary ID:

Word 1: DATARNF
Word 2: DLBFi
Words 3-10: Zero

Elements:

Item 1:	B1	B2PTR
Item 2:	P1	P2PTR
Item 3:	NUMCD	CDPTR
Item 4:	NUMPC	PCPTR
Item 5:	NUMPS	PSPTR
Item PSPTR:	PS (real array)	
Item PCPTR:	PC (real array)	
Item CDPTR:	CD (real array)	
Item P2PTR:	P2	P3PTR
Item B2PTR:	B2	B3PTR

2 packed 30 bit integers per word

The above format is repeated for each body where:

P1	=	Alphanumberic name of the first panel (H format)
B1	=	Alphanumeric name of the first body (H format)
P2PTR	=	Pointer to the word containing the next panel name (P2PTR is zero if P1 is the last panel)
B2PTR	=	Pointer to word containing next body name (B2PTR is zero if B1 is the last body)
NUMCD	=	Number of panel coordinates
NUMPC	=	Number of panel chordwise divisions
NUMPS	=	Number of panel spanwise divisions
CDPTR	=	Pointer to the first panel coordinate, CD(1)
PCPTR	=	Pointer to the first panel chordwise division (PC(1)
PSPTR	=	Pointer to the first spanwise division (PS(1)
PS	=	Array of panel spanwise divisions
PC	=	Array of panel chordwise divisions
CD(1)	=	Panel inboard leading edge x-coordinate
CD(2)	=	Panel inboard trailing edge x-coordinate
CD(3)	=	Panel outboard leading edge x-coordinate
CD(4)	=	Panel outboard trailing edge x-coordinate
CD(5)	=	Panel inboard y-coordinate
CD(6)	=	Panel outboard y-coordinate
CD(7)	=	Panel inboard z-coordinate
CD(8)	=	Panel outboard z-coordinate

Generation: Program INPUTP of the doublet-lattice preprocessor.

DUBLAT CONTROL AND SIZE MATRIX

File: DATARNF

Index Name: DLCSi

Type: MIXED

Dimensions: 110*1

Auxiliary ID:

Word 1:	DATARNF
Word 2:	DLCSi
Words 3-10:	Zero

Elements:

Items 1-3:	Reserved for future use.		
Item 4:	NUMNS	NSPTR	2 packed 30 bit integers per word
Item 5:	NUMMS	MSPTR	
Item 6:	NUMGD	GDPTR	
Item GDPTR:	GD (real array)		
Item MSPTR:	MS (integer array)		
Item NSPTR:	NS (integer array)		

Where:

NUMNS	=	Number of problem size parameters
NUMMS	=	Number of matrix sizes
NUMGD	=	Number of gust data parameters
NSPTR	=	Pointer to the first problem size parameter, NS(1)
GDPTR	=	Pointer to the first gust size parameter, GD(1)
GD(1)	=	Gust reference plane dihedral
GD(2)	=	Gust reference point
GD(3)	=	Aircraft velocity
GD(4)	=	Gust vertical velocity
NS(1)	=	Number of vibration modes
NS(2)	=	Number of Mach numbers

MSPTR	=	Pointer to the first matrix size parameter, MS(1)
NS(3)	=	Number of reduced frequency values
NS(4)	=	Number of lifting bodies
NS(5)	=	Number of bodies with doublets
NS(6)	=	Number of body doublet divisions
NS(7)	=	Number of body interference panels
NS(8)	=	Number of lifting panels
NS(9)	=	Number of strips on the body panels
NS(10)	=	Number of strips on the lifting panels
NS(11)	=	Number of boxes on the body panels
MS(1)	=	Length of the DLCSi matrix
MS(2)	=	Length of the DLPGi matrix
MS(3)	=	Length of the DLBGi matrix
MS(4)	=	Length of the DLDIi matrix
MS(5)	=	Length of the DLVIi matrix
MS(6)	=	Zero
MS(7)	=	Length of the DLPIi matrix
MS(8)	=	Length of the DLMCi matrix
MS(9)	=	Length of the DLSSi matrix
MS(10)	=	Length of the B1Cij matrix
MS(11)	=	Length of the B2Cij matrix
MS(12)	=	Length of the SGCij matrix
MS(13)	=	Length of the SBCij matrix
MS(14)	=	Zero
MS(15)	=	Length of the DBCij matrix
MS(16)	=	Length of the VPCij matrix
MS(17)	=	Length of the PSCij matrix
MS(18)	=	Length of the DLRBi matrix
MS(19)	=	Length of the ACMij matrix
MS(20)	=	Length of the GFOijkl matrix
MS(21)	=	Length of the SFOijkl matrix
MS(22)	=	Length of the SDOijkl matrix
MS(23)	=	Length of the PDOijkl matrix
MS(24)	=	Length of the M1Oij matrix
MS(25)	=	Length of the M3Oij matrix
MS(26)	=	Length of the Qzzxxkl matrix
MS(27)	=	Length of the SFBijkl matrix
MS(28)	=	Zero
MS(29)	=	Length of the modal coefficient matrix

<u>Generation:</u> Program INPUTP of the doublet-lattice preprocessor.

DUBLAT BODY DOUBLET GEOMETRY MATRIX

File: DATARNF

Index Name: DLDIi

Type: MIXED

Dimensions: $(\text{NUMDBL}*8 + 2* \sum_{i=1}^{\text{NUMDBL}} \text{NUMAD}_i)*1$

Where:

NUMDBL = Number of bodies with doublets
NUMAD = Number of doublet axis divisions for the i-th body with doublets

Auxiliary ID:

Word 1: DATARNF
Word 2: DLDIi
Words 3-10: Zero

Elements:

Item 1:	B1	B2PTR
Item 2:	NUMCD	CDPTR
Item 3:	NUMAD	ADPTR
Item 4:	NUMRD	RDPTR
Item RDPTR:	RD (real array)	
Item ADPTR:	AD (real array)	
Item CDPTR:	CD	
Item B2PTR:	B2	B3PTR

2 packed 30 bit integers per word

The above format is repeated for each body with doublets where:

B1	=	Alphanumeric name of the first body with doublets
NUMCD	=	Number of body axis coordinates
NUMAD	=	Number of body axis doublet divisions
NUMRD	=	Number of body radii
B2PTR	=	Pointer to the word containing the next body name (B2PTR is zero if B1 is the last body)
CDPTR	=	Pointer to the first body axis coordinate, CD(1)
ADPTR	=	Pointer to the first body axis division, AD(1)
RDPTR	=	Pointer to the first body radii, RD(1)
RD	=	Array of body radii
AD	=	Array of body x-axis division coordinates
CD(1)	=	Body axis y-coordinate (real)
CD(2)	=	Body axis z-coordinate (real)
CD(3)	=	Body y-doublet option (integer)
CD(4)	=	Body z-doublet option (integer)

Generation: Program INPUTP of the doublet-lattice preprocessor.

DUBLAT MODAL CONTROL MATRIX

File: DATARNF

Index Name: DLMCi

Type: MIXED

Dimensions: (4 + NUMID + NUMMI) * 1

Where:

NUMID	=	Number of elastic modes matrix names defined in the MODAL DATA
NUMMI	=	Number of modal instructions defined as the total number of regions (i.e., box subsets or body id's) used in the MODAL DATA

Auxiliary ID:

Word 1:	DATARNF
Word 2:	DLMCi
Words 3-10:	Zero

Elements:

Item 1:	NUMID	IDPTR	2 packed 30 bit integers per word
Item 2:	NUMLM	LMPTR	
Item 3:	NUMIM	IMPTR	
Item 4:	NUMDM	DMPTR	
Item IDPTR:	ID (integer array)		
Item LMPTR:	LM		
Item IMPTR:	IM		
Item DMPTR:	DM		

Where:

NUMID	=	Number of matrix id names
NUMLM	=	Number of lifting surface mode instructions
NUMIM	=	Number of interference surface mode instructions
NUMDM	=	Number of doublet body mode instructions
IDPTR	=	Pointer to the first matrix id, ID(1)
LMPTR	=	Pointer to the first lifting surface mode instruction, LM(1)
IMPTR	=	Pointer to the first interference surface mode instruction, IM(1)
DMPTR	=	Pointer to the first doublet body mode instruction, DM(1)
LM IM DM	=	Integer arrays containing mode instruction words with the following format:

Bits 47-39:	Integer code = 1 for lifting surface 2 for interference surface 3 for body doublet
Bits 38-30:	Matrix id index (refers to position in id array)
Bits 29-0:	Box subset name or body name

<u>Generation</u>: Program INPUTP of the doublet-lattice preprocessor.

DUBLAT LIFTING SURFACE GEOMETRY MATRIX

File: DATARNF

Index Name: DLPGi

Type: MIXED

Dimensions: $(NUMPP * 12 + \sum_{i=1}^{NUMPP} (NUMCD_i + NUMSD_i) * 1$

Where:

NUMPP	=	Number of lifting surface panels
NUMCD	=	Number of chordwise divisions on the i-th panel
NUMSD	=	Number of spanwise divisions on the i-th panel

Auxiliary ID:

Word 1:	DATARNF
Word 2:	DLPGi
Word 3-10:	Zero

Elements:

Item 1:	P1 PZPTR	2 packed 30 bit integers per word
Item 2:	NUMCD CDPTR	
Item 3:	NUMPC PCPTR	
Item 4:	NUMPS PSPTR	
Item PSPTR:	PS (real array)	
Item PCPTR:	PC (real array)	
Item CDPTR:	CD (real array)	
Item P2PTR:	P2 P3PTR	

The above format is repeated for each panel where:

P1	=	Alphanumeric name of the first panel (H format)
P2PTR	=	Pointer to the word containing the next panel name. (P2PTR is zero if P1 is the last panel)
NUMCD	=	Number of panel coordinates
NUMPC	=	Number of panel chordwise divisions
NUMPS	=	Number of panel spanwise divisions
CDPTR	=	Pointer to the first panel coordinate, CD(1)
PCPTR	=	Pointer to the first panel chordwise division, PC(1)
PSPTR	=	Pointer to the first panel spanwise division, PS(1)
PS	=	Array of panel spanwise divisions
PC	=	Array of panel chordwise divisions
CD(1)	=	Panel inboard leading edge x-coordinate
CD(2)	=	Panel inboard trailing edge x-coordinate
CD(3)	=	Panel outboard leading edge x-coordinate
CD(4)	=	Panel outboard trailing edge x-coordinate
CD(5)	=	Panel inboard y-coordinate
CD(6)	=	Panel outboard y-coordinate
CD(7)	=	Panel inboard z-coordinate
CD(8)	=	Panel outboard z-coordinate

Generation: Program INPUTP of the doublet-lattice preprocessor.

DUBLAT PRESSURE SCALING DATA

File: DATARNF

Index Name: DLPIi

Type: MIXED

Dimensions: $(\text{NUMPRS} * 4 + \sum_{i=1}^{\text{NUMPRS}} \text{NUMBSS}_i) * 1$

Where:

NUMPRS = Number of pressure correction instructions

NUMBSS = Number of box subsets for the i-th pressure correction instruction

Auxiliary ID:

Word 1: DATARNF
Word 2: DLPIi
Words 3-10: Zero

Elements:

Item			
Item 1:	P1FLG	P2PTR	2 packed 30 bit integers
Item 2:	PSREAL		
Item 3:	PSIMAG		
Item 4:	NUMBS	BSPTR	2 packed 30 bit integers
Item BSPTR:	BS (integer array)		
Item P2PTR:	P2FLG	P3PTR	

The above format is repeated for each pressure correction instruction input where:

P1FLG = Keyword PRESS (or SCALA) if the pressure replacement (or scaling) option is selected

P2PTR = Pointer to word containing the keyword PRESS (or SCALA) for the next pressure correction

PSREAL = Real part of pressure replacement value or pressure scale factor

PSIMAG	=	Imaginary part of pressure replacement value or pressure scale factor
NUMBS	=	Number of box subsets
BSPTR	=	Pointer to the first box subset name, BS(1)
BS	=	Array of box subset names

Generation: Program INPUTP of the doublet-lattice preprocessor.

DUBLAT RIGID BODY MODES MATRIX

File:	DATARNF		
Index Name:	DLRBi		
Type:	MIXED		
Dimensions:	(10 + 6*NUMRBM)*1		
	Where:		
	NUMRBM	=	Number of rigid body modes input
Auxiliary ID:	Word 1:		DATARNF
	Word 2:		DLRBi
	Words 3-10:		Zero

Elements:

Item 1:	LENRBI	=	Length of array	
Item 2:	8HMOTIONPT			
Item 3:	Zero			
Item 4:	NUMRBM	=	Number of rigid body modes	
Item 5:	1.0	=	Number of first mode	
Item 6:	NUMRBM	=	Number of last mode	
Item 7:	XREF	=	Reference point x-coordinate	
Item 8:	YREF	=	Reference point y-coordinate	
Item 9:	ZREF	=	Reference point z-coordinate	
Item 10:	TX	=	Translation in X	
Item 11:	TY	=	Translation in Y	
Item 12:	TZ	=	Translation in Z	Mode 1
Item 13:	RX	=	Rotation about X	
Item 14:	RY	=	Rotation about Y	
Item 15:	RZ	=	Rotation about Z	

Items 10-15 are repeated for each mode.

Item (10+6*NUMRBM): 8HMOTIONPT

Generation: Program INPUTP of the doublet-lattice preprocessor.

DUBLAT SUBSET DATA MATRIX

File: DATARNF

Index Name: DLSSi

Type: MIXED

Dimensions: $$(2 + NUMMSS * 2 + \sum_{i=1}^{NUMSS} \frac{MAXNUM_i - 1}{60} + 1)*1$$

Where:

NUMSS	=	Number of subsets input
MAXNUM	=	Maximum numerical value of all integers in the i-th subset

Auxiliary ID:

Word 1:	DATARNF
Word 2:	DLSSi
Words 3-10:	Zero

Elements:

Item 1:	SSPTR	
Item 2:	BSPTR	
Item BSPTR:	B1	B2PTR
	NUMBW	BWPTR
Item BWPTR:	BW	
Item B2PTR:	B2	B3PTR

2 packed 30 bit integers per word

The above format is repeated for each box subset.

Item SSPTR:	S1	S2PTR
	NUMSW	SWPTR
Item SWPTR:	SW	
Item S2PTR:	S2	S3PTR

The above format is repeated for each strip subset where:

SSPTR	=	Pointer to the word containing the first strip subset id
BSPTR	=	Pointer to the word containing the first box subset id
B1	=	First box subset id
B2PTR	=	Pointer to the word containing the second box subset id (B2PTR = 0 if B1 is the last box subset)
NUMBW	=	Number of box subset words = [(largest box number in subset - 1) /60] + 1
BWPTR	=	Pointer to the first word in the box subset instruction, BW(1)
BW	=	An array of 60 bit words with the i-th bit indicating the presence (bit=1) or absence (bit=0) of the i-th box number in the box subset
S1	=	First strip subset ID
S1PTR	=	Pointer to the word containing the second strip subset id (S2PTR = 0 if S1 is the last strip subset)
NUMSW	=	Number of strip subset words = [(largest strip number in subset -1)/60] + 1
SWPTR	=	Pointer to the first word in the strip subset instruction, SW(1)
SW	=	An array of 60 bit words with the i-th bit indicating the presence (bit = 1) or absence (bit = 0) of the i-th strip number in the strip subset

Generation: Program INPUTP of the doublet-lattice preprocessor.

DUBLAT VELOCITY PROFILE DATA

File: DATARNF

Index Name: DLVIi

Type: MIXED

Dimensions: $(\text{NUMVP} * 7 + 2 + \text{NUMVU} + 2 * \sum_{i=1}^{\text{NUMVP}} \text{NUMVR})*1$

Where:

NUMVP	=	Number of velocity profiles
NUMVU	=	Number of USE instructions for velocity profiles
NUMVR	=	Number of velocity ratios (V_{LOCAL}/V_∞) defined for the i-th velocity profile

Auxiliary ID:

Word 1:	DATARNF
Word 2:	DLVIi
Words 3-10:	Zero

Elements:

Item 1:	NUMVU	VUPTR	
Item 2:	VDPTR		
Item VDPTR:	V1	V2PTR	2 packed 30 bit integers per word
Item VDPTR+1:	NUMCD	CDPTR	
Item VDPTR+2:	NUMVR	VRPTR	
Item VDPTR+3:	DLEOPT		
Item VDPTR+4:	DTEOPT		
Item VDPTR+5:	DERLE		
Item VDPTR+6:	DERTE		
Item VRPTR:	VR (real array)		
Item CDPTR:	CD (real array)		
Item V2PTR:	V2	V3PTR	
Item VUPTR:	VU (integer array)		

Where:

NUMVU	=	Number of velocity profile USE instructions
VUPTR	=	Pointer to the first velocity profile USE instruction, VU(1)
VDPTR	=	Pointer to the word containing the first velocity profile name
V1	=	Alphanumeric name of the first velocity profile
V2PTR	=	Pointer to the word containing the next velocity profile name (V2PTR is zero if V1 if the last velocity profile)
NUMCD	=	Number of velocity profile chord points
NUMVR	=	Number of velocity ratio values
CDPTR	=	Pointer to the first velocity profile chord point, CD(1)
VRPTR	=	Pointer to the first velocity profile velocity ratio, VR(1)
VR	=	Array of velocity ratios
CD	=	Array of velocity profile chord points
DLEOPT DTEOPT	=	Options for derivative at leading/trailing edge -1 = slope will be calculated by program 1 = first derivative supplied 2 = second derivative supplied
DERLE DERTE	=	Derivative supplied for leading/trailing edge
VU	=	Array of 2 packed alphanumeric names per word: bits 59-30: Velocity profile ID bits 29-0: Strip subset ID

Generation: Program INPUTP of the doublet-lattice preprocessor.

GEOMETRY COMPONENT ID MATRIX

File:	DATARNF
Index Name:	GCØMPID
Type:	MIXED
Dimensions:	N*1 where N is the total number of geometry components defined via the geometry input data ($N \leq 60$).
Auxiliary ID:	Word 1: DATARNF Word 2: GCØMPID Words 3-10: Zero
Elements:	Row i contains the ID name of the i-th sequentially-defined geometry component. Each ID is a user-defined unique BCD string of 1-7 characters stored in display code, left adjusted and blank filled. Interrogation of the i-th component data stored in GDEF00i on DATARNF by the nodal preprocessor is effected by requiring the ID to be the same as the name of the nodal input reference frame.
Generation:	Program GDEFSIM of the geometry data preprocessor

GEOMETRY COMPONENT DATA MATRICES

File: DATARNF

Index Name: GDEF001, GDEF002, ..., GDEF00n, where n (≤ 60) is the input sequence number of the component.

Type: MIXED

Dimensions: (4 + NB + 2*NK) where:

NB = Size of buffer containing component control curve definitions.

NK = Number of curves and their location in buffer.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	The matrix index name
Words 3-10:	Zero

Elements: These matrices, one for each component, contain the following data:

Item 1: NP = Number of points in points array, PT(NP,3)

Item 2: NL = Number of lines in lines array, ALN(NL,3)

Item 3: NK

Item 4: NB

Item 5-(NB+4):

Data defining longitudinal control curves for this component (BFR). (ref. 50-41)

Items (NB+5)-(NB+2*NK+4):

Array of curve types, KRV(NK,1), and locations, KRV(NK,2) in BFR.

Generation: Program GDEFSIM of the geometry data preprocessor.

SPACING MATRIX

File:	DATARNF	
Index Name:	GKD001a, GKD002a, ..., GKD999a	
Type:	MIXED	
Dimensions:	M*1 where M is less than or equal to 3000. All data for a particular element are fully contained in one of the matrices.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	The matrix index name.
	Words 3-10:	Zero

Elements:

Item 1:

Bits 59-30:	Reserved for future use.
Bits 29-15:	NF, number of elements contained in this matrix.
Bits 14-0:	NBEG, internal number of first element in this partition.

Item 2-(NF+1):

Each word contains descriptions of an element. Each description corresponds to the element referred to in the same position in the Flexible Element Matrix (KSF) with the same set and partition number.

Bits 59-54:	EG, the element code (integer).
Bits 53-30:	Reserved for future use.
Bits 29-15:	NTOT, total number of words in data body.
Bits 14-0:	POINT, pointer to the body of element data (0 if no spacing defined and no defaults).

Item (NF+2)-M:

These blocks of element data contain the spacing properties. Each property is a real number that is stored in one word.

Generation: Program DGINPT of the detail geometry preprocessor.

SPACING LOWER BOUNDS MATRIX

File: DATARNF

Index Name: GKE001a, GKE002a, ..., GKE999a

Type: MIXED

Dimensions: M*1 where M is less than or equal to 3000. All data for a particular element are fully contained in one of the matrices.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	The matrix index name.
Words 3-10:	Zero

Elements:

Item 1:

Bits 59-30:	Reserved for future use.
Bits 29-15:	NF, number of elements contained in this matrix.
Bits 14-0:	NBEG, internal number of first element in this partition.

Item 2-(NF+1):

Each word contains descriptions of an element. Each description corresponds to the element referred to in the same position in the Flexible Element Matrix (KSF) with the same set and partition number.

Bits 59-54:	EG, the element code (integer).
Bits 53-30:	Reserved for future use.
Bits 29-15:	NTOT, total number of words in data body.
Bits 14-0:	POINT, pointer to the body of element data (0 if no spacing defined and no defaults).

Item (NF+2)-M:

These items contain the blocks of element spacing properties. Each property is a real number that is stored in one word.

__Generation__: Program DGINPT of the detail geometry preprocessor.

SPACING UPPER BOUNDS MATRIX

File: DATARNF

Index Name: GKF001a, GKF002a, ..., GKF999a

Type: MIXED

Dimensions: M*1 where M is less than or equal to 3000. All data for a particular element are fully contained in one of the matrices.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	The matrix index name.
Words 3-10:	Zero

Elements:

Item 1:

Bits 59-30:	Reserved for future use.
Bits 29-15:	NF, number of elements contained in this matrix.
Bits 14-0:	NBEG, internal number of first element in this partition.

Item 2-(NF+1):

Each word contains descriptions of an element. Each description corresponds to the element referred to in the same position in the Flexible Element Matrix (KSF) with the same set and partition number.

Bits 59-54:	EG, the element code (integer).
Bits 53-30:	Reserved for future use.
Bits 29-15:	NTOT, total number of words in data body.
Bits 14-0:	POINT, pointer to the body of element data (0 if no spacing defined and no defaults).

Item (NF+2)-M:

These items contain the blocks of element spacing properties. Each property is a real number that is stored in one word.

<u>Generation</u>: Program AGINPT of the detail geometry preprocessor.

CROSS SECTION MATRIX

File:	DATARNF	
Index Name:	GKS001a, GKS002a, ..., GKS999a	
Type:	MIXED	
Dimensions:	M*1 where M is less then or equal to 3000. All data for a particular element are fully contained in one of the matrices.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	The matrix index name.
	Word 3:	M
	Words 4-10:	Zero

Elements:

Item 1:	Bits 59-30:	Reserved for future use.
	Bits 29-15:	NF, number of elements contained in this matrix.
	Bits 14-0:	NBEG, internal number of first element in this partition.
Item 2-(NF+1):		
	Bits 59-54:	EG, the element code (integer).
	Bits 53-50:	CON, number of concepts described in the data body.
	Bits 49-39:	Reserved for future use.
	Bits 38-30:	NTOT, total number of words in element data body.
	Bits 29-15:	ULABEL, element user number.
	Bits 14-0:	POINT, pointer to the body of element data (0 if no concepts defined).

Item (NF+2)-M:

Additional description of the elements, (blocks of element data). The pointer word contains the following packed integers.

Bits 59-54:	POINT1, pointer to the first concept (0 if NOCON)
Bits 53-48:	NUM1, number of first concept.
Bits 47-42:	POINT2, pointer to second concept (0 if no concept or NOCON).
Bits 41-36:	NUM2, number of second concept.
Bits 35-30:	POINT3, pointer to third concept (0 if no concept or NOCON).
Bits 29-24:	NUM3, number of third concept.
Bits 23-18:	POINT4, pointer to fourth concept (0 if no concept or NOCON)
Bits 17-12:	NUM4, number of fourth concept.
Bits 11-6:	POINT5, pointer to fifth concept (0 if no concept or NOCON).
Bits 5-0:	NUM5, number of fifth concept.

The word following the pointer word is the first word of the element concept data. These concept properties are real numbers written one to a word.

<u>Generation</u>: Program DGINPT of the detail geometry preprocessor.

CROSS SECTION LOWER BOUNDS MATRIX

File:	DATARNF	
Index Name:	GKT001a, GKT002a, ..., GKT999a	
Type:	MIXED	
Dimensions:	M*1 where M is less than or equal to 3000. All data for a particular element are fully contained in one of the matrices.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	The matrix index name.
	Word 3:	M
	Words 4-10:	Zero

Elements:

Item 1:	Bits 59-30:	Reserved for future use.
	Bits 29-15:	NF, number of elements contained in this matrix.
	Bits 14-0:	NBEG, internal number of first element in this partition.
Item 2-(NF+1):		
	Bits 59-54:	EG, the element code (integer).
	Bits 53-50:	CON, number of concepts described in the data body.
	Bits 49-39:	Reserved for future use.
	Bits 38-30:	NTOT, total number of words in element data body.
	Bits 29-15:	ULABEL, element user number.
	Bits 14-0:	POINT, pointer to the body of element data (0 if no concept defined).

Item (NF+2)-M:

Additional description of the elements, (blocks of element data). The pointer word contains the following packed integers.

Bits 59-54:	POINT1, pointer to the first concept (0 if NOCON).
Bits 53-48:	NUM1, number of first concept.
Bits 47-42:	PØINT2, pointer to second concept (0 if no concept or NOCON).
Bits 41-36:	NUM2, number of second concept.
Bits 35-30:	POINT3, pointer to third concept (0 if no concept or NOCON)
Bits 29-24:	NUM3, number of third concept.
Bits 23-18:	POINT4, pointer to fourth concept (0 if no concept or NOCON)
Bits 17-12:	NUM4, number of fourth concept.
Bits 11-6:	POINT5, pointer to fifth concept (0 if no concept or NOCON).
Bits 5-0:	NUM5, number of fifth concept.

The word following the pointer word is the first word of the element concept data. These concept properties are real numbers written one to a word.

Generation: Program DGINPT of the detail geometry preprocessor.

CROSS SECTION UPPER BOUNDS MATRIX

File:	DATARNF	
Index Name:	GKU001a, GKU002a, ..., GKU999a	
Type:	MIXED	
Dimensions:	M*1 where M is less than or equal to 3000. All data for a particular element are fully contained in one of the matrices.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	The matrix index name.
	Word 3:	M
	Words 4-10:	Zero

Elements:

Item 1:	Bits 59-30:	Reserved for future use.
	Bits 29-15:	NF, number of elements contained in this matrix.
	Bits 14-0:	NBEG, internal number of first element in this partition.
Item 2-(NF+1):		
	Bits 59-54:	EG, the element code (integer).
	Bits 53-50:	CON, number of concepts described in the data body.
	Bits 49-39:	Reserved for future use.
	Bits 38-30:	NTOT, total number of words in element data body.
	Bits 29-15:	ULABEL, element user number.
	Bits 14-0:	POINT, pointer to the body of element data (0 if no concept defined).

Item (NF+2)-M:

Additional description of the elements, (blocks of element data). The pointer word contains the following packed integers.

Bits 59-54:	POINT1, pointer to the first concept (0 if NOCON).
Bits 53-48:	NUM1, number of first concept.
Bits 47-42:	POINT2, pointer to second concept (0 if no concept or NOCON).
Bits 41-36:	NUM2, number of 2nd concept.
Bits 35-30:	POINT3, pointer to third concept (0 if no concept or NOCON).
Bits 29-24:	NUM3, number of third concept.
Bits 23-18:	POINT4, pointer to fourth concept (0 if no concept or NOCON).
Bits 17-12:	NUM4, number of fourth concept.
Bits 11-6:	POINT5, pointer to fifth concept (0 if no concept or NOCON).
Bits 5-0:	NUM5, number of fifth concept.

The word following the pointer word is the first word of the element concept data. These concept properties are real numbers written one to a word.

<u>Generation</u>: Program DGINPT of the detail geometry preprocessor.

SUBSTRUCTURE ASSEMBLY CONTROL VECTOR

File: DATARNF

Index Name: IACVsss

Type: MIXED

Dimensions: N * 1 where N = number of nodes in this substructure

Auxiliary ID: Zero

Elements: A typical entry (j) in the matrix is associated with internal node number j and contains four 15 bit fields.

Bits 59-45: 15 freedom indicators for up to 15 degrees of freedom, left to right, per node. A 1 bit in this field indicates that the freedom is free. A zero bit indicates that the freedom is not free.

Bits 44-30: 15 freedom indicators for up to 15 degrees of freedom, left to right, per node. A 1 bit in this field indicates that the freedom is to be retained. A zero bit indicates that the freedom is not to be retained.

Bits 29-15: 15 freedom indicators for up to 15 degrees of freedom, left to right, per node. A 1 bit in this field indicates that the freedom is to be supported (with zero or non-zero specified displacement). A zero bit indicates that the freedom is not to be supported.

Bits 14-0: Reserved for future use.

Generation: Program LODOWN of the interact preprocessor

SUBSTRUCTURE DOWNWARDS LOADCASE RUNCODES MATRIX

File: DATARNF

Index Name: IDLCsss

Type: MIXED

Dimensions: N * 1 where N = number of loadcases for the substructure at the next higher level.

Auxiliary ID: Zero

Elements: The i-th entry corresponds to the i-th loadcase in the next higher level substructure. The value of this i-th entry is the number of the loadcase in substructure sss which corresponds to the i-th loadcase in the higher level substructure. A value of 0 indicates that no loadcase in substructure sss corresponds to the i-th loadcase in the next higher level substructure.

Generation: Program LODOWN of the interact preprocessor

SUBSTRUCTURE LOADCASE EXPANSION RUNCODE MATRIX

File: DATARNF

Index Name: IELCsss

Type: MIXED

Dimensions: (N+1)*1 where N = number of loadcases applied to the substructure.

Auxiliary ID: Zero

Elements: Item 1 gives the total number of loadcases which are coming down to this substructure due to interaction. Item i gives the column number "coming down" of the i-1 loadcase applied to the substructure.

Generation: Program LODOWN of the interact preprocessor

SUBSTRUCTURE FREEDOM ACTIVITY VECTOR

File: DATARNF

Index Name: IFAVsss

Type: MIXED

Dimensions: N*1 where N = (number of nodes + 3)/4.

Auxiliary ID: Zero

Elements: Item j consists of 4 packed 15 bit integers. The 15 bits are associated (left to right) with the fifteen degrees of freedom at the corresponding internal node. A "0" bit indicates no stiffness for the corresponding freedom; a "1" bit indicates positive stiffness.

Bits 59-45:	Node 4j-3
Bits 44-30:	Node 4j-2
Bits 29-15:	Node 4j-1
Bits 14-0:	Node 4j

Generation: Program JMAT of the interact preprocessor

SUBSTRUCTURE LOADCASE CORRESPONDENCE TABLE

File: DATARNF

Index Name: ILCLsss

Type: MIXED

Dimensions: 11*N where N is the number of loadcases for this structure during back substitution.

Auxiliary ID: Zero

Elements: Column i contains the following information for i-th internal loadcase:

Item 1: USERID. This is either a character string stored left adjusted with zero fill or a positive integer.

Items 2-11: USER TITLE. This is stored as a text string. If no user title is input, items 2-11 are zero.

Generation: Program LODOWN of the interact preprocessor

SUBSTRUCTURE LOADCASE CORRESPONDENCE TABLE WITHOUT TEXT STRING

File: DATARNF

Index Name: ILCØsss

Type: MIXED

Dimensions: N*1 when N is the number of loadcases.

Auxiliary ID: Zero

Elements: Item j contains the loadcase id corresponding to internal loadcase j.

Generation: Program JRCGEN of the interact preprocessor.

SUBSTRUCTURE LOADCASE DOWNWARD ORDER VECTOR

File:	DATARNF
Index Name:	ILDØsss
Type:	MIXED
Dimensions:	N*1 where N is the number of loadcases requested for back substitution.
Auxiliary ID:	Zero
Elements:	Item j contains the j-th loadcase identifier requested.
Generation:	Programs LODOWN and SUBCNTR of the interact preprocessor.

SUBSTRUCTURE LOADS FREEDOM ACTIVITY VECTOR

File: DATARNF

Index Name: ILFAsss

Type: MIXED

Dimensions: N*1 where N = (number of nodes + 3)/4.

Auxiliary ID: Zero

Elements: Item j consists of 4 packed 15 bit integers. The 15 bits are associated (left to right) with the fifteen degrees of freedom at the corresponding internal node. A "0" bit indicates no load for the corresponding freedom. A "1" bit indicates a load at that freedom.

Bits 59-45:	Node 4j-3
Bits 44-30:	Node 4j-2
Bits 29-15:	Node 4j-1
Bits 14-0:	Node 4j

Generation: Program JMAT of the interact preprocessor

LOCAL COORDINATE SYSTEMS MATRIX

File:	DATARNF	
Index Name:	ILØCsss	
Type:	MIXED	
Dimensions:	13*N where N is number of local coordinate systems.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	ILØCsss
	Words 3-10:	Zero

Elements: A typical column j contains the following information pertaining to local coordinate system j:

Item 1:	Bits 59-18:	User ID for local coordinate system. Display code left-adjusted, blank-filled.
	Bits 17-0:	The characters (BCD) CYL, SPH or REC to indicate the type of coordinate system (cylindrical, spherical or rectangular).
Item 2-4:	Global coordinates of local origin (x, y, z).	
Item 5-13:	Elements of the 3 x 3 transformation matrix, t, that transforms a global representation to a local V(local) = t V(global). The order of the elements is t11, t21, t31, t12, ..., t33.	

Generation: Program SUBCNTR of the interact preprocessor.

SUBSTRUCTURE REDUCED LOADS RUNCODE MATRIX

File:	DATARNF
Index Name:	ILRCsss
Type:	MIXED
Dimensions:	N*1 where N = number of loadcases applied to the substructure.
Auxiliary ID:	Zero
Elements:	The i-th item gives the internal loadcase number in the next higher substructure into which the i-th internal loadcase of this substructure is to be merged.
Generation:	Program JRCGEN of the interact preprocessor

SUBSTRUCTURE NODAL CORRESPONDENCE TABLE

File:	DATARNF
Index Name:	INC1sss
Type:	MIXED
Dimensions:	M*1 where:
	M = 4+J+K+N
	J = (LNN+59)/60-I/60
	I = (((SSN-1)/60)*60)+1
	K = (J+3)/4
	N = Number of nodes
	LNN = Largest user node number
	SNN = Smallest user node number
Auxiliary ID:	Zero

Elements:

Item 1:	I
Item 2:	Highest user node number
Item 3:	Pointer to start of block 2
Item 4:	Pointer to start of block 3
Item 5-x:	Block 1 where x = J+4

Table to indicate the presence of a user ID. Bit 59 in the first word corresponds to the number in Item 1. Successive bits represent sequentially increasing node numbers. If a bit is "on" the number represented by it is a valid user node number.

Item x+1-y: Block 2 where y = K+X

Each word contains 4 packed 15 bit integers each of which has a value equal to the cumulative sum of all the "on" bits up to but not including the corresponding word in Block 1. Thus, the first word in Block 2 contains these sums for the first 4 words in Block 1 and so on.

Item y+1-y+n: Block 3 where n = number of nodes

A typical row y+i contains 3 packed 20 bit integers as follows:

Bits 59-40: The user node number, (j), corresponding to the internal node number (i).

Bits 39-20: Pointer, (k) to the nodal data matrix. Row (k) of the nodal data matrix contains the coordinates of internal node (i), user node (j).

Bits 19-0: The internal node number, (m), corresponding to the user node number represented by the i-th "on" bit in Block 1.

<ins>Generation</ins>: Program SUBCNTR of the interact preprocessor

SUBSTRUCTURE NODAL DATA MATRIX

File:	DATARNF	
Index Name:	INDMsss	
Type:	MIXED	
Dimensions:	N*4 where N is the number of nodes in this substructure.	
Auxiliary ID:	Zero	
Elements:	A typical row of the substructure nodal data matrix contains:	
Item 1:	Bits 59-47 and 34-18:	Contribution bit indicators for substructures forming this substructure.
	Bits 46-35:	Analysis frame.
	Bits 17-0:	User node number.
Item 2:	Node x coordinate	
Item 3:	Node y coordinate	
Item 4:	Node z coordinate	
Generation:	Program MERGSS of the interact preprocessor	

SUBSTRUCTURE RETAINED FREEDOM VECTOR

File: DATARNF

Index Name: IRFVsss

Type: MIXED

Dimensions: N*1 where N = number of retained freedoms in this substructure.

Auxiliary ID: Zero

Elements: Item (j) is associated with the j-th retained freedom. This item contains 2 packed 30 bit integers as follows:

Bits 59-30: The internal node number for this retained freedom.

Bits 29-0: The freedom number for this retained freedom. Freedom number 1 is thrust in the X direction, number 5 is rotation about the Y axis, etc.

Generation: Program JMAT of the interact proprocessor

SUBSTRUCTURE SORTING POINTER MATRIX

File: DATARNF

Index Name: ISPNsss

Type: MIXED

Dimensions: (2N+1)*1 where N is the number of substructures interacting in this substructure.

Auxiliary ID: Zero

Elements:

- Item 1: Pointer to the start of the information in ISRTsss for the first interacting substructure.
- Item n: Pointer to the start of the information in ISRTsss for the n-th interacting substructure.
- Item n+1: Dimension of ISRTsss.
- Item n+2: Display code equivalent of the first interacting substructure number.
- Item 2n+1: Display code equivalent of the n-th interacting substructure number.

  Note: Item (i+1)-Item (i) equals the number of nodes in the i-th interacting substructure.

Generation: Program MERGSS of the interact preprocessor.

SUBSTRUCTURE REDUCED STIFFNESS RUNCODE MATRIX

File: DATARNF

Index Name: ISRCsss

Type: MIXED

Dimensions: N*1 where N is the row dimension of the reduced stiffnesss matrix for this substructure.

Auxiliary ID: Zero

Elements: A typical item i contains 2 packed 30 bit integers as follows:

Bits 59-30: node number, nn

Bits 29-0: freedom number, nf

These two integers indicate that the freedom indicated by row i in the IRFVsss matrix is synonymous with and to be merged into node nn and freedom nf of the next higher level substructure.

Generation: Program JRCGEN of the interact preprocessor

SUBSTRUCTURE SORTING MATRIX

File:	DATARNF
Index Name:	ISRTsss
Type:	MIXED
Dimensions:	N*1 where N is the sum of the number of nodes in the interacting substructures forming this substructure.
Auxiliary ID:	Zero
Elements:	This matrix is partitioned into groups for all interacting substructures. Each word represents one node in one substructure and contains 4 pieces of information.

Bits 59-45:	15 bits from the IACVsss entry for this node, either the "free freedoms" or the "retained freedoms"
Bits 44-33:	Internal node number
Bits 32-12:	User node number
Bits 11-0:	Sorting position for this node in the nodal data matrix

Generation:	Program MERGSS of the interact preprocessor.

SUBSTRUCTURE DEFINITION VECTOR

File: DATARNF

Index Name: ISSCsss

Type: MIXED

Dimensions: (N+1)*1 where N = the number of substructures that are merged into the index substructure sss.

Auxiliary ID: Zero

Elements: Item 1 contains up to 3 packed integers as follows:

Bits 29-24:	Stage number, NSTAGE.
Bits 23-18:	Set number, NSET.
Bits 17-0:	Nsi, the index (sss) substructure number.

NSTAGE and NSET would be zero if the substructure sss is not a lowest level substructure.

Items 2 to (N+1) would be present only if the index substructure (sss) happens to be the result of merging 2 or more substructures together. In that case, a typical item would be as follows:

Bits 29-24:	Stage number, NSTAGE
Bits 23-18:	Set number, NSET
Bits 17-0:	Substructure number, sss

NSTAGE and NSET would be zero if sss is not a lowest level substructure.

Generation: Program SUBCNTR of the interact preprocessor.

SET/STAGE - SUBSTRUCTURE CORRESPONDENCE VECTOR

File:	DATARNF
Index Name:	ISSSCØR
Type:	MIXED
Dimensions:	N*1 where N = the number of substructures in the total analysis.
Auxiliary ID:	Word 1: DATARNF Word 2: ISSSCØR Words 3-10: Zero
Elements:	Item i contains 4 packed integers as follows:

Bits 41-30: NSSU = Upper substructure into which the substructure NSS is to be merged.

Bits 29-24: NSTAGE = Stage number.

Bits 23-18: NSET = Set number.

Bits 17-0: NSS = Substructure number.

The item indicates that the substructure number NSS is the same as set NSET, stage NSTAGE, and it is to be merged into substructure NSSU.

If an item has NSET = NSTAGE = 0, it implies that the substructure NSS is a higher level substructure.

If an item has NSSU = 0, it implies that the upward merging of the substructure NSS has not been defined.

One of the items may contain the following additional information.

Bit 59: ON

Bits 47-42: NSET - Set number assigned to the highest substructure.

The substructure NSS in this item is the highest substructure in the interaction process.

All items may contain the following additional information:

Bit 49: Indicator of formation of the final nodal data for the substructure. Bit is on if the final nodal data has been formed. Bit is off otherwise.

Bit 48: Indicator of formation of the "proper" freedom activity vector for the substructure. Bit is on if the proper vector has been formed. Bit is off otherwise.

<u>Generation</u>: Program SUBCNTR of the interact preprocessor.

SUBSTRUCTURE TRACEBACK MATRIX

File: DATARNF

Index Name: ITRBsss

Type: MIXED

Dimensions: N*1 where N is the number of nodes in the lowest level substructures in this substructure. Common nodes (from more than one substructure) have one entry for each substructure.

Auxiliary ID: Zero

Elements: A typical word ontains the following data:

Bits 59-30:	User node number in substructure sss.
Bits 29-18:	Lower level substructure number that contributed this node.
Eits 17-0:	User node number in the low level substructure for this node.

All entries for a node in substructure sss are grouped togehter.

Generation: Programs JMAT and SUBCNTR of the interact preprocessor.

SUBSTRUCTURE USER FREEDOM REFERENCE TABLE

File: DATARNF

Index Name: IUFRsss

Type: MIXED

Dimensions: 95 * 1

Auxiliary ID: Zero

Elements:

Item 1: Substructure number (integer).

Item 2: Bits 59-18: User selected display code (H format) freedom activity label for partition 1 of the equilibrium equations. Default is 4HFREE.

Bits 17-0: Sum of partition 1 freedoms.

Item 3: Bits 59-18: Same as Item 2 but for partition 2. Default is 6HRETAIN.

Bits 17-0: Sum of partition 2 freedoms.

Item 4: Bits 59-18: Same as Item 2 but for partition 3. Default is 7HSUPPORT.

Bits 17-0: Sum of parition 3 freedoms.

Item 5: Reserved for future use.

Items 6-20: User selected freedom labels (1 or 2 character BCD left-adjusted blank-filled words) for man/machine communications associated with the internal kinematic freedoms 1-15, respectively, for all rectangular Cartesian coordinate reference frames associated with set x and stage i. Default words are TX, TY, TZ, RX, RY, and RZ, respectively.

Items 21-35: Same as items 6-20 but for all cylindrical reference frames. Default words are TR, TT, TZ, RR, RT and RZ, respectively.

Items 36-50: Same as items 6-20 but for all spherical reference frames. Default words are TR, TT, TP, RR, RT, and RP, respectively.

Items 51-65: User selected freedom force labels (1 or 2 chracter BCD left-adjusted blank-filled words) for man/machine communications associated with the internal force freedoms 1-15, respectively, for all rectangular Cartesian coordinate reference frames associated with set x and stage i. Default words are FX, FY, FZ, MX, MY, and MZ.

Items 68-80: Same as items 51-65 but for all cylindrical reference frames. Default words are FR, FT, FZ, MR, MT, and MP, respectively.

Items 81-95: Same as items 51-65 but for all spherical reference frames. Default words are FR, FT, FP, MR, MT, and MP, respectively.

Generation: Programs JMAT and SUBCNTR of the interact preprocessor.

ELEMENT KEY MATRIX

File: DATARNF

Index Name: KELEKEY

Type: MIXED

Dimensions: N * 1 where N is a variable that is dependent upon the number of element types and the number of stress types, properties and property input combinations for each of the stiffness finite elements in the ATLAS library.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	KELEKEY
Words 3-10:	Zero

Elements:

Row 1: Integer that is the total number of element types (NEL) currently available in ATLAS.

Row 2-(NEL+1):

Element identification and addresses.

Bits 59-24: Literal identifications of element types in left adjusted, blank-filled display code.

Bits 23-15: Zero-filled.

Bits 14-0: Right-adjusted 15 bit integers that are equal to the first row of data for each element type. For a specific element type (I), let ELROW(I) be the beginning row.

Row (NEL+2)-26:

Blank - reserved for future use.

The rest of the matrix will be occupied by NEL blocks of data, a block for each element type. Within each block, the following 4 groups of data

are stored in the order indicated for each element type (I).

GROUP	NUMBER OF ROWS	DESCRIPTION
1	2	General information and table of contents for element type (I).
2	NP	Property literals.
3	NS	Stress literals.
4	NLPIC+1	Information for legal property input combinations.

The contents of each row in these 4 groups are described in detail below:

GROUP 1:

Row ELROW (I) - Three packed integers.

Bits 59-48:	LLPCE	Relative location of legal property input combinations with respect to row ELROW(I). The information for the combinations will be stored in a block of rows beginning with row (ELROW(I) + LLPCE).
Bits 47-39:	MAXNOD	Maximum number of nodes required to describe the element.
Bits 38-30:	MINNOD	Minimum number of nodes required to describe the element.
Bits 29-0:	--	Zero-filled, reserved for future use.

Row ELROW(I)+1 - Five packed 12 bit integers.

Bits 59-48:	NP	Number of items in the property list.
Bits 47-36:	NS	Number of stress types.

Bits 35-24:	NLPIC	Number of legal property input combinations (≤7).
Bits 23-12:	NN	Maximum number of nodes used in the printing of element type information.
Bits 11-0:	LSTL	Relative location of stress literals with respect to ELROW(I). The stress literals are stored in a block of rows beginning with row (ELROW(I) + LSTL).

Groups 2 and 3 contain literals that are right adjusted, blank filled in display code:

GROUP 2:

Row ELROW+2 PROP(1) - First element property literal.

Row ELROW+NP+1 PROP(NS) - Last element property literal.

GROUP 3:

Row ELROW(I)+LSTL STRS(1) - First element stress literal.

Row ELROW(I)+LSTL+NS-1 STRS(NS) - Last element stress literal.

GROUP 4:

Row ELROW(I)+LLPCS	NLPIC 6 bit integers stored left to right, zero filled. Each integer identifies the number of input values corresponding to one of the legal property input combinations. The case where all properties are input is not included.
Rows ELROS(I)+LLPCE+1 to ELROW(I)+LLPCE+NLPIC	Expansion keys for legal property input combinations. Each key is made up of 4 bit integers and occupies as many words as needed. The integers are stored left to right with zero fill in the last

word. As an example, assume the property list contains 10 items (NP = 10) and only 3 of these items are input; the other 7 being defaulted. The expansion key, 1 2 3 0 0 1 2 2 0 3, would indicate the following:

a) Input value 1 would be used for PROP(1) and PROP(6).

b) Input value 2 would be used for PROP(2), PROP(7) and PROP(8).

c) Input value 3 would be used for PROP(3) and PROP(10).

d) PROP(4), PROP(5) and PROP(9) would be set equal to zero.

Generation: Program ELKEYPR of the elementkey preprocessor.

ELEMENT KEY MATRIX

ROW	CONTENTS		DESCRIPTION
1		13	No. of Element Types
2	ROD	27	
	BEAM	38	
	SPAR	70	
	COVER	110	
	PLATE	145	
	GPLATE	170	
	BRICK	205	
	SCALAR	220	
	SROD	245	
	SPLATE	260	
	CPLATE	280	
14	CCOVER	300	
26			

ELEMENT KEY MATRIX (Cont'd)

Element: ROD or 1

ROW						Description
27	7	2	2			LLPCE, MAXNODE, MINNODE
	2	3	1	2	4	NP, NS, NLPIC, NN, LSTL
29					A(1)	Property Literals
					A(2)	
31					P	
					P/A(1)	Stress Literals
					P/A(2)	
34	1					NP(i)
35	1 1					Expansion Keys

ELEMENT KEY MATRIX (Cont'd)

Element: BEAM or 2

ROW						
38	23	5	2			LLPCE,MAXNODE,MINNODE
	13	8	7	5	15	NP,NS,NLPIC,NN,LSTL

ROW		
40	A(1)	Property Literals
	A-VY(1)	
	A-VZ(1)	
	J(1)	
	IY(1)	
	IZ(1)	
	A(2)	
	A-VY(2)	
	A-VZ(2)	
	J(2)	
	IY(2)	
	IZ(2)	
	CONSTR	
53	P(2)	Stress Literals
	VY(2)	
	VZ(2)	
	T(2)	
	MY(1)	
	MY(2)	
	MZ(1)	
	MZ(2)	

ROW										
61	1	2	3	4	6	7	12			NP(i)

ROW																
	1	0	0	0	0	0	1	0	0	0	0	0	0			Expansion Keys
	1	0	0	0	0	2	1	0	0	0	0	2	0			
	1	0	0	0	2	3	1	0	0	0	2	3	0			
	1	0	0	0	2	3	1	0	0	0	2	3	4			
	1	2	3	4	5	6	1	2	3	4	5	6	0			
	1	2	3	4	5	6	1	2	3	4	5	6	7			
68	1	2	3	4	5	6	7	8	9	10	11	12	0			

ELEMENT KEY MATRIX (Cont'd)

Element: SPAR or 3

ROW						
70	23	2	2			LLPCE,MAXNODE,MINNODE
	13	8	9	2	15	NP,NS,NLPIC,NN,LSTL

ROW		
72	T-WEB	Property Literals
	FAREA1U	
	FAREA1L	
	FAREA2U	
	FAREA2L	
	O(1)U	
	O(1)L	
	O(2)U	
	O(2)L	
	A-LMP1U	
	A-LMP1L	
	A-LMP2U	
	A-LMP2L	
85	P-CAPU	Stress Literals
	SIGMA-U	
	P-LMPU	
	P-CAPL	
	SIGMA-L	
	P-LMPL	
	Q-EQUIV	
	TAU-MAX	

ROW											
93	1	2	3	5	6	7	9	10	11		NP(I)

ROW																
	1	0	0	0	0	0	0	0	0	0	0	0	0			Expansion Keys
	1	2	2	2	2	0	0	0	0	0	0	0	0			
	1	2	2	2	2	3	3	3	3	0	0	0	0			
	1	2	3	2	3	4	5	4	5	0	0	0	0			
	1	2	3	2	3	4	5	4	5	6	6	6	6			
	1	2	3	2	3	4	5	4	5	6	7	6	7			
	1	2	3	4	5	6	7	8	9	0	0	0	0			
	1	2	3	4	5	6	7	8	9	10	10	10	10			
102	1	2	3	4	5	6	7	8	9	10	11	10	11			

ELEMENT KEY MATRIX (Cont'd)

Element: COVER or 4

ROW						
110	22	4	3			LLPCE, MAXNODE, MINNODE,
	10	10	7	4	12	NP, NS, NLPIC, NN, LSTL

ROW		
112	T(0)U	Property Literals
	T(1)U	
	T(2)U	
	ALPHAU	
	BETAU	
	T(0)L	
	T(1)L	
	T(2)L	
	ALPHAL	
	BETAL	
122	SIGMA1U	Stress Literals
	SIGMA2U	
	TAU12U	
	SIG-S1U	
	SIG-S2U	
	SIGMA1L	
	SIGMA2L	
	TAU12L	
	SIG-S1L	
	SIG-S2L	

ROW											
132	1	2	3	4	5	6	8				NP(i)

ROW																
	1	0	0	0	0	1	0	0	0	0						Expansion Keys
	1	0	0	0	0	2	0	0	0	0						
	1	2	3	0	0	1	2	3	0	0						
	1	2	0	0	0	3	4	0	0	0						
	1	2	3	4	5	1	2	3	4	5						
	1	2	3	0	0	4	5	6	0	0						
139	1	2	3	0	4	5	6	7	0	8						

ELEMENT KEY MATRIX (Cont'd)

Element: PLATE or 5

ROW						
145	12	8	3			LLPCE,MAXNODE,MINNODE
	5	5	4	8	7	NP,NS,NLPIC,NN,LSTL
147					T(0)	Property Literals
					TS(1)	
					TS(2)	
					ALPHA	
					BETA	
152					SIGMA1	Stress Literals
					SIGMA2	
					TAU12	
					SIGMAS1	
					SIGMAS2	

ROW											NP(i)
157	1	2	3	4							NP(i)

ROW																
	1	0	0	0	0											Expansion Keys
	1	0	0	2	0											
	1	2	3	0	0											
161	1	2	2	3	4											

ELEMENT KEY MATRIX (Cont'd)

Element: GPLATE or 6

ROW						
170	19	9	3			LLPCE, MAXNODE, MINNODE
	11	6	10	9	13	NP, NS, NLPIC, NN, LSTL

ROW		
172	T-MEMB1	Property Literals
	T-MEMB2	
	T-MEMB3	
	T-MEMB4	
	T-MEMB5	
	T-BEND1	
	T-BEND2	
	T-BEND3	
	T-BEND4	
	T-BEND5	
	ALPHA	
183	SIGMA1	Stress Literals
	SIGMA2	
	TAU12	
	M1	
	M2	
	M12	

ROW											
189	1	2	3	4	5	6	7	8	9	10	NP(i)

ROW																
	1	1	1	1	1	1	1	1	1	1	0					Expansion Keys
	1	1	1	1	1	2	2	2	2	2	0					
	1	1	1	1	1	2	2	2	2	2	3					
	1	2	3	4	0	0	0	0	0	0	0					
	1	2	3	4	0	0	0	0	0	0	5					
	1	2	3	0	0	4	5	6	0	0	0					
	1	2	3	0	0	4	5	6	0	0	7					
	1	2	3	4	0	5	6	7	8	0	0					
	1	2	3	4	0	5	6	7	8	0	9					
199	1	2	3	4	5	6	7	8	9	10	0					

ELEMENT KEY MATRIX (Cont'd)

Element: BRICK or 8

ROW						
205	0	47	8			LLPCE,MAXNODE,MINNODE
	0	6	0	8	2	NP,NS,NLPIC,NN,LSTL
207					SIGMA1	Stress Literals
					SIGMA2	
					SIGMA3	
					TAU12	
					TAU13	
212					TAU23	

ELEMENT KEY MATRIX (Cont'd)

Element: SCALAR or 9

ROW	Contents	
220	14, 3, 1, (blank), (blank)	LLPCE,MAXNODE,MINNODE
	6, 6, 3, 3, 8	NP,NS,NLPIC,NN,LSTL
222	K(T1)	Property Literals
	K(T2)	
	K(T3)	
	K(R1)	
	K(R2)	
	K(R3)	
228	F1	Stress Literals
	F2	
	F3	
	M1	
	M2	
	M3	
234	1, 2, 3	NP(i)
	1 0 0 0 0 0	Expansion Keys
	1 0 0 2 0 0	
237	1 2 3 0 0 0	

ELEMENT KEY MATRIX (Cont'd)

Element: SROD or 10

ROW						
245	8	3	3			LLPCE,MAXNODE,MINNODE
	2	5	1	3	4	NP,NS,NLPIC,NN,LSTL
247					A(1) A(2)	Property Literals
249					P1 P2 P21/L (P/A)1 (P/A)2	Stress Literals
254	1					NP(i)
255	1 1					Expansion Keys

ELEMENT KEY MATRIX (Cont'd)

Element: SPLATE or 11

ROW						
260	0	8	4			LLPCE,MAXNODE,MINNODE
	1	7	0	4	3	NP,NS,NLPIC,NN,LSTL
262					T	Property Literal
263					Q-EQUIV	Stress Literals
					Q21	
					Q23	
					Q43	
					Q41	
					TAU-MAX	
269					W-AVG	

ELEMENT KEY MATRIX (Cont'd)

Element: CPLATE or 12

ROW						
280	0	8	3			LLPCE,MAXNODE,MINNODE
	12	3	0	8	14	NP,NS,NLPIC,NN,LSTL
282					AREF	Property Literals
					LAM01	
					LAM02	
					LAM03	
					LAM04	
					LAM05	
					LAM06	
					LAM07	
					LAM08	
					LAM09	
					LAM10	
					THICK	
294					EPS1	Stress Literals
					EPS2	
					GAM12	
					SIGMA1	
					SIGMA2	
					TAU12	

ELEMENT KEY MATRIX (Cont'd)

Element: CCOVER or 13

ROW						
300	0	4	3			LLPCE, MAXNODE, MINNODE
	24	6	0	4	26	NP, NS, NLPIC, NN, LSTL
302					AREF-U	Property Literals
					AREF-L	
					LAM01-U	
					LAM02-U	
					LAM03-U	
					LAM04-U	
					LAM05-U	
					LAM06-U	
					LAM07-U	
					LAM08-U	
					LAM09-U	
					LAM10-U	
					LAM01-L	
					LAM02-L	
					LAM03-L	
					LAM04-L	
					LAM05-L	
					LAM06-L	
					LAM07-L	
					LAM08-L	
					LAM09-L	
					LAM10-L	
					THICK-U	
					THICK-L	
326					EPS1U	Stress Literals
					EPS2U	
					GAM12U	
					EPS1L	
					EPS2L	
					GAM12L	

MATERIAL CODE MATRIX

File:	DATARNF	
Index Name:	KMATERA	
Type:	MIXED	
Dimensions:	100 * 1	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	KMATERA
	Words 3-10:	Zero
Elements:	Row K of the matrix contains the integer K if material properties are defined for material code K. If no properties are defined, row K is zero.	
Generation:	Program DPMATER of the material data preprocessor.	

MATERIAL DATA MATRICES

File: DATARNF

Index Name: KM00001, KM00002, ..., KM00050 for standard materials.

KM00051, KM00052, ..., KM00099 for special materials

Type: MIXED

Dimensions: N * 32 where N is the number of temperatures at which material properties are defined for a material property code--the code being defined by MXX where XX are the last two digits in the matrix name.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	The matrix index name
Words 3-10:	Zero

Elements: Each row of the matrix contains the following data:

Col. 1: The temperature at which the properties are specified (° Fahrenheit)

Col. 2: Density (lbs/cubic inch) at 70°F

Col. 3,7,11: E , E , E , Youngs moduli (psi)

Col. 4,8,12: ν_{12} , ν_{23} , ν_{31} , Poissons ratios

Col. 5,9,13: G , G , G , Shear moduli (psi)

Col. 6,10,14: ε_1 , ε_2 , ε_3 , Linear thermal strain (percent).

Col. 15-17: FTU1, FTU2, FTU3 ultimate tension stress allowables (psi) in directions 1-2-3, respectively

Col. 18-20: FCU1, FCU2, FCU3 ultimate compression stress allowables (psi) in directions 1-2-3, respectively

Col. 21-23: FSU1, FSU2, FSU3 ultimate shear stress allowables (psi) in planes 1-2, 2-3, 3-1, respectively

Col. 24-26: FTY1, FTY2, FTY3 yield tension stress allowables (psi) in directions 1-2-3, respectively

Col. 27-29: FCY1, FCY2, FCY3 yield compression stress allowables (psi) in directions 1-2-3, respectively

Col. 30-32: FSY1, FSY2, FSY3 yield shear stress allowables (psi) in planes 1-2, 2-3, 3-1, respectively

NOTE: The property data are defined relative to the orthogonal (natural) axes, denoted by 1-2-3, of the material. A single subscript denotes a particular axis, whereas a double subscript denotes a particular natural-axes plane relative to which the property is associated.

<u>Generation</u>: Program DPMATER of the material data preprocessor.

COMPOSITE MATERIAL MATRIX

File:	DATARNF	
Index:	KCMSUMM	
Type:	MIXED	
Dimension:	N*1, where N = NCO+1+NTj*NV	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	KCMSUMM
	Word 3:	NSP, number of materials defined.
	Words 4-10:	Zero

Elements:

Item 1:	Bits 59-29:	A 1 in bit j indicates that material 60-j has been defined.
	Bits 28-5:	Reserved.
	Bits 4-0:	NCO, the maximum material number defined.
Item 2-NCO:		
	Bits 59-48:	Thickness*1000 (layer thickness).
	Bits 47-25:	Future use.
	Bits 24-19:	Number of values per temperature NV
	Bits 18-15:	Number of temperature levels.
	Bits 14-0:	Pointer to data. Item i+1 is the pointer word for material Ci.

Item NCO+2-N:

The following data for each temperature (NTj temperatures for the j-th material).

ORDER	PROP	COMMENTS
0	S	Area density (lb/in^2): before first temp.
1	T	Temperature °F
2	E1	Young's mod in first direction
3	E2	Young's mod in second direction
4	V12	Poisson's ratio
5	G12	Shear mod
6	ET1	Thermal strain in first direction
7	ET2	Thermal strain in second direction
8	FTU1	
9	FTU2	
10	FCU1	
11	FCU2	
12	FSU	
13	FTY1	Allowables
14	FTY2	
15	FCY1	
16	FCY2	
17	FSY	

Generation: Program DPMATER of the material data preprocessor.

FLEXIBLE ELEMENT CONTROL MATRIX

File:	DATARNF
Index Name:	KECØMAa
Type:	MIXED
Dimensions:	M * 1 where M is equal to the number of flexible element matrices
Auxiliary ID:	Word 1: DATARNF Word 2: KECØMAa Words 3-10: Zero
Elements:	Row i contains the first word of the flexible element data matrix i.
Generation:	Program SELEPRO of the stiffness preprocessor.

ELEMENT PROPERTY CODE MATRICES

File:	DATARNF		
Index Names:	KEPCVRa	(input order)	
	KEPCVIa	(internal order)	
	KEPCVUa	(user order)	
Type:	MIXED		
Dimensions:	M*1, where M = (Number of elements + 4)/5		
Auxiliary ID:	Word 1:	DATARNF	
	Word 2:	The matrix index name.	
	Words 3-10:	Zero	

Elements: Bits 59-48 of word i contain the property code for the (5i-4)th element in the respective order, Bits 47-36 contain the property code for the (5i-3)th element, etc. Thus the property codes are stored left to right, 5 to a word. The unused portion of the last word is zero filled.

Generation: Programs SELERCH and SELEPRO of the stiffness preprocessor.

NODAL INPUT COORDINATE SYSTEMS

File: DATARNF

Index Name: KINPCSa

Type: MIXED

Dimensions: M * 1 where M equals the number of rows in the KNOALTa matrix.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	KINPCSa
Words 3-10:	Zero

Elements: A typical row of the matrix contains:

Bits 59-12:	Reserved for future use
Bits 11-0 :	Input local coordinate system

The node represented by row i is identical to that represented by row i in the nodal data matrix. Thus the nodal correspondence table may be used to obtain the node-row correspondence of this matrix.

Generation: Program SSTINCO of the stiffness preprocessor.

FLEXIBLE ELEMENT CORRESPONDENCE TABLE

File: DATARNF

Index Name: KLCT00a

Type: MIXED

Dimensions: M * 1 where M is the number of flexible elements.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	KLCT00a
Words 3-10:	Zero

Elements: A typical row (i) contains 4 packed 15 bit integers, (j), (k), (L) and (M) described as follows:

Bits 59-45:	(j) input sequence number corresponding to internal element (i)
Bits 44-30:	(k) Internal element number corresponding to input sequence number (i)
Bits 29-15:	(L) User element numbers stored in increasing order
Bits 14-0:	(M) Internal element number corresponding to user element number (L)

Generation: Program SELEPRO of the stiffness preprocessor.

LOCAL COORDINATE SYSTEMS MATRIX

File:	DATARNF	
Index Name:	KLØCØØa	
Type:	MIXED	
Dimensions:	13 * N where N is number of local coordinate systems.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	KLØCØØa
	Words 3-10:	Zero

Elements: A typical column j contains the following information pertaining to local coordinate system j:

Item 1:	Bits 59-18:	User ID for local coordinate system. Display code left-adjusted, blank-filled.
	Bits 17-0:	The characters (BCD) CYL, SPH or REC to indicate the type of coordinate system (cylindrical, spherical or rectangular).
Item 2-4:	Global coordinates of local origin (x, y, z).	
Item 5-13:	Elements of the 3 x 3 transformation matrix, t, that transforms a global representation to a local V(local) = t V(global). The order of the elements is t11, t21, t31, t12, ..., t33.	

Generation: Program SNODRCH of the stiffness preprocessor.

FLEXIBLE ELEMENT NODAL MATRIX

File: DATARNF

Index Name: KMELNØa

Type: MIXED

Dimensions: M * 1 where:

$$M = 1 + L + \sum_{i=1}^{L} (Ni + 4)/5$$

L = number of flexible structural elements
Ni= number of nodes defining element i ($\geq$ 1)

Auxiliary ID:

Word 1:	DATARNF
Word 2:	KMELNØa
Words 3-10:	Zero

Elements:

Item 1:

Bits 59-15:	Not used at present
Bits 14-0:	Number of flexible structural elements.

Item 2-L+1: Contain 5 packed numbers per element.

Bits 59-54:	Element code (integer)
Bits 53-47:	Number of nodes (integer)
Bits 46-39:	The element property summary.

The element property summary is zero except for the following elements:

BEAM:	Bit 46:	1 if IY > 0 0 if IY = 0
	Bit 45:	1 if IZ > 0 0 if IZ = 0
	Bits 44-39:	0

COVER:	Bit 46:	1 if upper surface present. 0 if no surface present
	Bit 45:	Similar for lower surface.
	Bits 44-39:	0
CPLATE:	Bits 46-43:	Number of laminae.
	Bits 42-39:	0
CCOVER:	Bits 46-43:	Number of laminae in upper plate.
	Bits 42-39:	Lower plate.

Bits 38-30: Reserved for future use

Bits 29-15: Element user label (integer)

Bits 14-0: Pointer (within this matrix) to packed nodes for this element (integer)

Items L+2-M: Contains up to 5 packed 12 bit integers per word, representing the internal nodes for a particular element. For each element, this information starts in the left-most position of the word defined by the pointer of this element and uses as many words as needed by the number of nodes. For all words a fill left to right is employed. Unused bits are zero filled.

Generation: Program SELEPRO of the stiffness preprocessor.

NODAL CORRESPONDENCE TABLE

File: DATARNF

Index Name: KNC100a

Type: MIXED

Dimensions: M*1 where

M = 4+J+K+N

J = (LNN+59)/60-1/60

I = (((SNN-1)/60)*60)+1

K = (J+3)/4

N = Number of nodes

LNN = Largest user node number

SNN = Smallest user node number

Auxiliary ID: Zero

Elements:

Item 1: I

Item 2: Highest user node number

Item 3: Pointer to start of Block 2

Item 4: Pointer to start of Block 3

Item 5-X: Block 1 where x = J+4

Table to indicate the presence of a user id. Bit 59 in the first word corresponds to the number in item 1. Successive bits represent sequentially increasing node numbers. If a bit is "on" the number represented by it is a user node number.

Item X+1-Y: Block 2 where Y = K+X

Each word contains 4 packed 15 bit numbers each of which was a value equal to the cumulative sum of all the "on" bits up to but not including the corresponding word in Block 1. Thus the first word in Block 2 contains the sums for the first 4 words in Block 1 and so on.

Item Y+1-Y+N: Block 3 where N = number of nodes

A typical row Y+i contains 3 packed 20 bit integers as follows:

Bits 59-40: The user node number, (j), corresponding to the internal node number (i);

Bits 39-20: Pointer, (K), to the nodal data matrix. Row (K) of the nodal data matrix contains the coordinates of internal node (i), user node (j);

Bits 19-0: The internal node number, (m), corresponding to the user node number represented by the i-th "on" bit in Block 1.

Generation: Program SNODPRO of the stiffness preprocessor.

NODAL CONNECTIVITY MATRIX

File: DATARNF

Index Name: KNDCØNa

Type: MIXED

Dimensions: N*1 where N = 1 + NOD5 + NSTR + NCON.

NOD5 =	Number of nodes divided by 5.
NSTR =	Number of strucutral nodes.
NCON =	Variable depending on density of connectivity matrix.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	KNDCØNa
words 3-10:	Zero

Elements:

Item 1:

Bits 59-45:	Number of nodes.
Bits 44-30:	Number of structural nodes.
Bits 29-15:	Maximum nodal band width of lower triangular connectivity matrix (LTCM).
Bits 14-0:	Maximum number of non-zero elements in one row of LTCM.

Items 2-NOD5+1:

Item i+1 corresponds to the ith internal node and contains its internal structural node number (ISNN). If it is not a structural node the item is zero.

Items NOD5+2-NOD5+NSTR+1:

Bits 59-45:	ISNN of largest node connected to this structural node.
Bits 44-30:	ISNN of lowest node connected to this structural node. (Zero if no lower connectivity)

Bits 29-15:	Number of nodal connectivities for this node.
Bits 14-0:	Pointer to row of connectivity matrix for this node.

Items NOD5+NSTR+2-N:

For each structural node, the ISNN of lower connected nodes are packed five to a word.

<u>Generation</u>: Program SELEPRO of the stiffness preprocessor.

ELEMENT NODAL DATA MATRIX

File:	DATARNF	
Index Name:	KNØ001a, KNØ002a, ..., KNØ999a	
Type:	MIXED	
Dimensions:	M*1, where M is between 2500 and 3000 words, blocked so that the matrix does not contain partial element data.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	The matrix index name
	Words 3-10:	Zero

Elements:

Item 1:	Bits 59-30:	Reserved for future use.
	Bits 29-15:	NF, number of elements contained in this partition.
	Bits 14-0:	NBEG, internal number of first element in this partition.
Item 2-NF+1:		
	Bits 59-54:	EG, the element code.
	Bits 53-47:	NOD, the number of nodes.
	Bits 46-40:	Reserved for future use.
	Bits 39:	Flag for indicating existence of delta coordinates (if equal to 1).
	Bits 38-30:	Total number of words in data body.
	Bits 29-15:	ULABEL, element user number.
	Bits 14-0:	POINT, pointer to be body of element data.

Item NF+2-M:

POINT + 0:	Bits 59:	Indicates existence of shear nodes.
	Bits 58-47:	Input sequence number of node.
	Bits 46-35:	Analysis coordinate system.
	Bits 34-20:	Input record number of nodes.
	Bits 19-0:	User node number.

POINT + 1: X-coordinate for the first node.

POINT + 2: Y-coordinate for the first node.

POINT + 3: Z-coordinate for the first node.

POINT + 4: ΔX-coordinate for the first node.

POINT + 5: ΔY-coordinate for the first node.

POINT + 6: ΔZ-coordinate for the first node.

Repeat for the next node as ordered in KSF matrix.

Repeat for the next element.

Generation: Program SELEPRO of the stiffness proprocessor.

NODAL DATA MATRIX

File:	DATARNF	
Index Name:	KNØALTa	
Type:	MIXED	
Dimensions:	M*4 where M is dependent on the number and type of of nodes.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	KNOALTa
	Words 3-10:	Zero
Elements:	A typical row of the nodal data matrix contains:	
Item 1:	Bit 59:	Reserved for future use.
	Bits 58-47:	Input sequence number of the node.
	Bits 46-35:	Analysis coordinate system.
	Bits 34-20:	Input record number of the node.
	Bits 19-0:	User node number.
Item 2:	Node global X coordinate	
Item 3:	Node global Y coordinate	
Item 4:	Node global Z coordinate	

In the case of a node pair two consecutive rows have the same contents in column 1. The second row, in columns 2, 3, 4 contain the ΔX, ΔY, ΔZ values for the nodes. The data for user node n does not necessarily appear in row n of the nodal data matrix. The nodal correspondence table may be referred to obtain the node-row correspondence.

Generation: Program SSTINCO of the stiffness preprocessor.

PARAMETER MATRIX

File: DATARNF

Index Name: KPARMS1

Type: MIXED

Dimensions: 25 * N where N is the maximum defined stiffness set number. N is limited to 36.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	KPARMS1
Words 3-10:	Zero

Elements:

Item 1-8:	Eighty characters for problem identification. These 80 characters are taken directly from the PROBLEM ID card appearing at the head of the control program being executed at the time this data was read.
Item 9:	Number of nodes (integer $\leq$ 4095)
Item 10:	Number of nodal data matrix rows
Item 11:	Maximum user node number
Item 12:	A code word indicating the status of the stiffness input preprocessing
Item 13:	Number of flexible elements
Item 14:	Number of flexible structural data matrices
Item 15:	Number of rows (or structural elements) per structural data matrix (integer)
Item 16:	Number of rigid structural elements (integer)
Item 17:	Number of rigid structural data matrices (integer)
Item 18:	Number of property data records input
Item 19:	Number of special materials used.

Item 20: Number of defined execution stages

Item 21: Lumping factor.

Item 22: Maximum number of nodes used for brick elements.

Item 23: BIGBRICK indication -1 if nodal stresses are produced for bricks.

Item 24-25: Reserved for future use.

Generation: Program SSTINCO of the stiffness preprocessor.

PROPERTY DATA MATRIX

File:	DATARNF	
Index Name:	KPRØPSa	
Type:	MIXED	
Dimensions:	M*1, where M = 1+max property codes + $\sum(3+NPi)$ and NP is the number of properites for the ith property code.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	KPRØPSa
	Words 3-10:	Zero

Elements:

Item 1:

Bits 59-12:	Reserved for future use.
Bits 11-0:	MC, maximum property code used.

Item 2-(MC+1):

Item i + 1 contains information for property code i. If this code is not defined, item i + 1 is zero.

Bits 59-28:	Reserved for future use.
Bits 26-24:	Pt, property type 0 = regular, 1 = composite
Bits 23-15:	NP, number of properties for code i.
Bits 14-0:	P, points to property identifier.

Item (MC+2)-M:

Property identifiers and property values for each property code, NP+3 words are stored in consecutive words as follows:

Words 1-3: Thirty character property identifier input in text mode.

Words 4-NP+1: Property values.

<u>Generation</u>: Program SPRORCH of the stiffness preprocessor.

FLEXIBLE ELEMENT MATRICES (KSF-MATRICES)

File:	DATARNF	
Index Name:	KSF001a, KSF002a, ..., KSF999a.	
Type:	MIXED	
Dimensions:	M * 1 where M is currently not greater than 2500, initially 2500 words are reserved for each partition. When there is not enough room for the next element, or there are no more elements, its dimension is reduced to the actual number of words used.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	The matrix index name.
	Words 3-10:	Zero

Elements:

Item 1:	Bits 59-30:	Reserved for future use
	Bits 29-15:	NF, number of elements contained in this matrix (integer)
	Bits 14-0:	NBEG, internal number of first element in this partition (integer)
Item 2-NF+1:	Bits 59-54:	EG, the element code (integer)
	Bits 53-47:	NOD, the number of nodes (integer)
	Bits 46-39:	Reserved for future use
	Bits 38-30:	NTOT, total number of words in element data body (integer)
	Bits 29-15:	ULABEL, The element user number (integer)
	Bits 14-0:	POINT, pointer to the body of element data (integer)

Item NF+2-M: Additional description of the elements, (bodies of element data). The pointer word contains the following packed integers.

Bits 59-54:	PC, number of properties (integer)
Bits 53-48:	PP, property pointer, 0 if no properties (integer)
Bits 47-39:	Element property summary

The element property summary is zero except for the following elements:

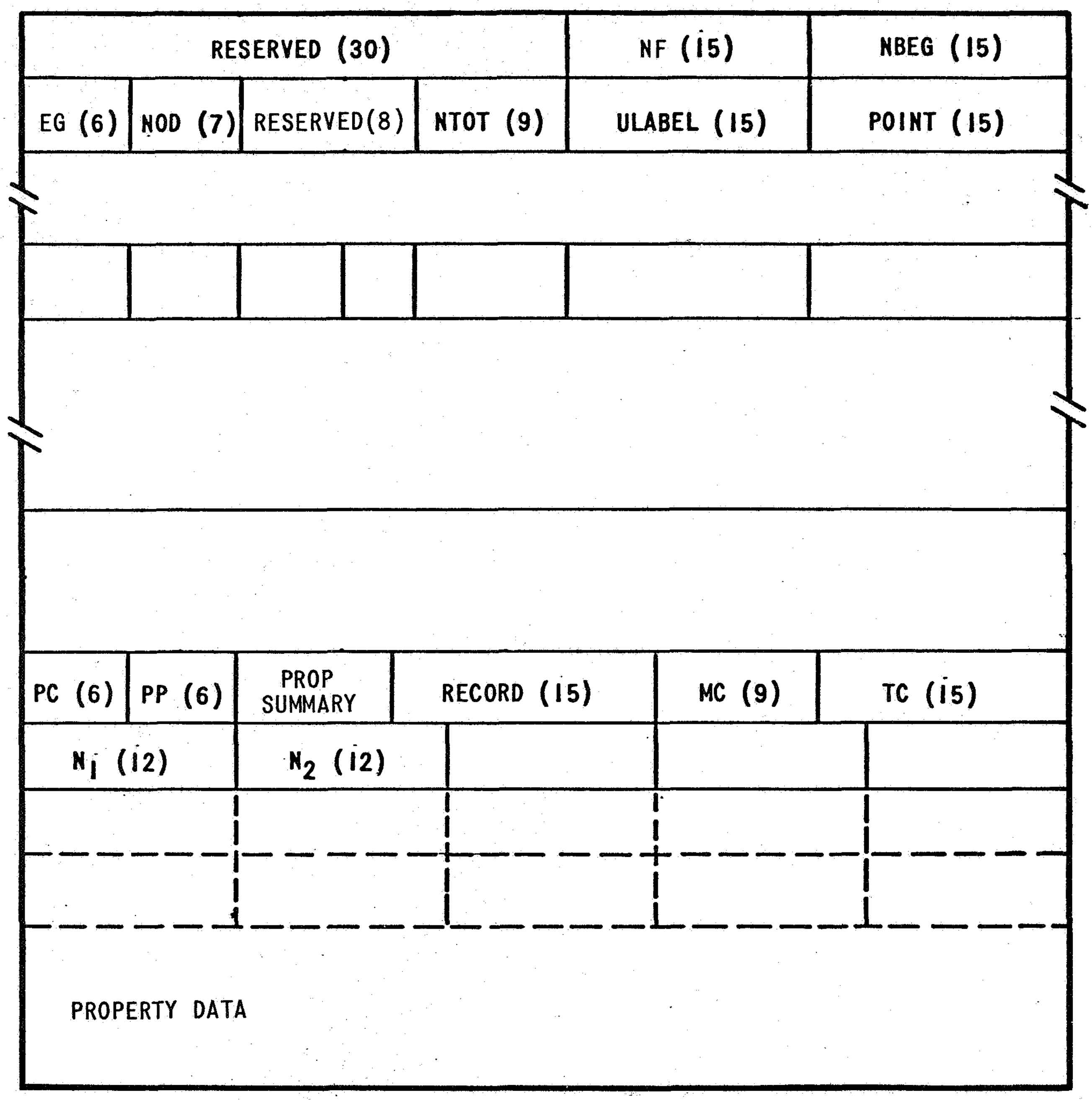
BEAM:	Bit 46:	1 if IY > 0 0 if IY = 0
	Bit 45:	1 if IZ > 0 0 if IZ = 0
SPAR:	Bit 46:	1 if T-Web > 0 0 if T-Web = 0
COVER:	Bit 46:	1 if upper surface present 0 if no upper surface
	Bit 45:	1 if lower surface present 0 if no lower surface
CPLATE:	Bits 47-44:	Number of laminae
CCOVER:	Bits 47-44:	Number of laminae in upper plate
	Bits 43-39:	Number of laminae in lower plate

Bits 38-24:	RECORD, the LODAREC input record number in which stiffness for this element was input (integer)
Bits 23-15:	MC, the material code. If greater than 400B, material is MC-400B but has zero weight (integer), if zero the material is a composite.
Bits 14-0:	TC, the element temperature +10000 in degrees Fahrenheit (integer)

The word following the pointer word is the first word of the element nodal data. The nodes (internal node numbers) are packed as 12 bit integers, 5 to a word, into this and the following words. The nodes are stored left to right with zero right fill. The number of nodal data words is thus (NOD+4)/5. There is at least one node and at most 127 nodes per element. If there are property data, PC is non-zero and the properties are stored in floating point form, one to a word directly following the nodal data. The property pointer PP is the relative address of the first property (PP+POINT).

A schematic picture of a flexible element matrix is shown below.

Generation: Program SELEPRO of the stiffness preprocessor.


RESERVED (30)
NF (15)
NBEG (15)
EG (6)
NOD (7)
RESERVED(8)
NTOT (9)
ULABEL (15)
POINT (15)
PC (6)
PP (6)
PROP SUMMARY
RECORD (15)
MC (9)
TC (15)
N_1 (12)
N_2 (12)
PROPERTY DATA

ASSEMBLY CONTROL VECTOR

File: DATARNF

Index Name: KACV0ba

Type: MIXED

Dimension: N * 1 where N is the number of nodes for this data set.

Auxiliary ID: Zero

Elements: A typical entry (j) in the matrix is associated with internal node number j and contains 4 15 bit fields.

Bits 59-45: 15 freedom indicators for up to 15 degrees of freedom, left to right, per node. A 1 bit in this field indicates that the freedom is "free." A zero bit indicates that the freedom is not free.

Bits 44-30: 15 freedom indicators for up to 15 degrees of freedom, left to right, per node. A 1 bit in this field indicates that the freedom is to be retained. A 0 bit indicates that the freedom is not to be retained.

Bits 29-15: 15 freedom indicators for up to 15 degrees of freedom, left to right, per node. A 1 bit in this field indicates that the freedom is to be supported (with zero or non-zero specified displacement). A 0 bit indicates that the freedom is not to be supported.

Bits 14-0: Reserved for future use.

Generation: Program SBCINPT of the boundary condition preprocessor.

LOAD CASE CORRESPONDENCE TABLE

File: DATARNF

Index Name: KCØØRba

Type: MIXED

Dimensions: 11 * N where N is the number of load cases defined by the loads data.

Auxiliary ID: Zero

Elements: Column i contains the following information for the i-th internal load case.

Item 1: USERID. This is either a character string stored left adjusted with zero fill or a positive integer.

Item 2-11: USER TITLE. Stored as a text string. If no user title is input, rows 2-11 are zero.

Generation: Program SBCINPT of the boundary condition preprocessor.

SPECIFIED DISPLACEMENT MATRIX

File:	DATARNF	
Index Name:	KD001ba,KD002ba,...,KD999ba	
Type:	MIXED	
Dimensions:	N*1 where N=block size (default 3000)	
Auxiliary ID:	Zero	
Elements:	This matrix consists of a set of word pairs.	
Item i:	Bits 59-48:	Direct loads internal case number
	Bits 47-36:	Internal node number
	Bits 35-30:	Freedom number
	Bits 29-15:	Input record number
	Bits 14- 9:	Reserved
	Bits 8 -0:	Internal local coordinate system number in which load was input (0=GLOBAL)
Item i+1:	Value of specified displacement	
Generation:	Program SBCINPT of the boundary condition preprocessor.	

RETAINED FREEDOM VECTOR

File: DATARNF

Index Name: KRFV0ba

Type: MIXED

Dimensions: N * 1 where N is the dimension of the reduced matrix for this data set and execution stage.

Auxiliary ID: Zero

Elements: Item (j) is associated with the j-th retained freedom. This item contains 2 packed 30 bit integers as follows:

Bits 59-30: The internal node number for this retained freedom.

Bits 29-0: The freedom number for this retained freedom. Freedom number 1 is thrust in the X direction, number 5 is rotation about the Y axis, etc.

Generation: Program SBCINPT of the boundary condition preprocessor.

USER FREEDOM REFERENCE TABLE

File:	DATARNF
Index Name:	KUFRT0a
Type:	MIXED
Dimensions:	95 * NS where NS is the number of defined boundary condition and superpositon stages.
Auxiliary ID:	Word 1: DATARNF Word 2: KUFRT0a Words 3-10: Zero
Elements:	The ith column corresponds to the ith input boundary condition or superposition stage. The row entries are:

Item 1:	Stage number (integer).	
Item 2:	Bits 59-18:	User selected freedom activity label for partition 1 of the equilibrium equations (H format). Default is 4HFREE.
	Bits 17-0:	Sum of partition 1 type freedoms.
Item 3:	Bits 59-18:	Same as Item 2 but for partition 2. Default is 6HRETAIN.
	Bits 17-0:	Sum of partition 2 type freedoms.
Item 4:	Bits 59-18:	Same as Item 2 but for partition 3. Default is 7HSUPPORT.
	Bits 17-0:	Sum of partition 3 type freedoms.
Item 5:	Reserved for future use.	

Item 6-20: User selected freedom labels (2 character BCD left-adjusted blank-filled words) for man/machine communications associated with the internal kinematic freedoms 1-15, respectively, for all rectangular Cartesian coordinate reference frames associated with set X and state i. Default words are TX, TY, TZ, RX, RY, and RZ, respectively.

Item 21-35: Same as items 6-20 but for all cylindrical reference frames. Default words are TR, TT, TZ, RR, RT, and RZ, respectively.

Item 36-50: Same as items 6-20 but for all spherical reference frames. Default words are TR, TT, TP, RR, RT, and RP, respectively.

Item 51-65: User selected freedom-force labels (2 character BCD left-adjusted blank-filled words) for man/machine communications associated with the internal force freedoms 1-15, respectively, for all rectangular Cartesian coordinate reference frames associated with set X and stage i. Default words are FX, FY, FZ, MX, MY, and MZ, respectively.

Item 66-80: Same as items 51-65 but for all cylindrical reference frames. Default words are FR, FT, FZ, MR, MT, and MZ, respectively.

Item 81-95: Same as items 51-65 but for all spherical reference frames. Default words are FR, FT, FP, MR, MT, and MP, respectively.

<u>Generation</u>: Program SBCINPT of the boundary condition preprocessor.

COMBINED LOAD CASE MATRIX

File:	DATARNF
Index Name:	LCØMBba
Type:	MIXED
Dimensions:	21 * NCLC. NCLC = number of combined load cases.
Auxiliary ID:	Word 1: DATARNF Word 2: LCØMBba Words 3-10: Zero
Elements:	Column i contains information about the i-th combined load case.
Item 1:	User ID for the i-th input combination load case
Item j:	User ID for the (j/2)th component load case
Item j+1:	Factor for the (j/2)th component load case
Generation:	Program NTRLUDE of the loads data preprocessor.

LOAD CASE CORRESPONDENCE TABLE

File: DATARNF

Index Name: LCØØRba

Type: MIXED

Dimensions: 11 * N where N is the number of load cases defined by the loads data.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	LCØØRba
Words 3-10:	Zero

Elements: Column i contains the following information for the i-th internal load case.

Item 1: USERID. This is either a character string stored left-adjusted with zero fill or a positive integer.

Item 2-11: USER TITLE. This is stored as a text string. If no user title is input, items 2-11 are zero.

Generation: Program NTRLUDE of the loads data preprocessor.

SPECIFIED DISPLACEMENT MATRIX

File:	DATARNF	
Index Name:	LD001ba, LD002ba, ..., LD999ba	
Type:	MIXED	
Dimensions:	N * 1 where N = block size (default 3000)	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	The matrix index name
	Words 3-10:	Zero
Elements:	This matrix consists of a set of word pairs.	
Item i:	Bits 59-48:	Direct loads internal case number
	Bits 47-36:	Internal node number
	Bits 35-30:	Freedom number
	Bits 29-15:	Input record number
	Bits 14-9:	Reserved
	Bits 8-0:	Internal local coordinate system number in which load was input. (0=global)
Item i+1:	Value of specified displacement.	
Generation:	Program NTRLUDE of the loads data preprocessor.	

DISTRIBUTED LOAD MATRIX

File:	DATARNF	
Index Name:	LE001ba, LE002ba, ..., LE999ba	
Type:	MIXED	
Dimensions:	N * 1 where N ≤ block size (default 3000)	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	The matrix index name
	Words 3-10:	Zero

Elements: This matrix is a string of vectors, each vector defining the distributed loading on one element for one load case (or one face in the case of a brick). A typical vector contains:

Item 1:	Bits 59-45:	Internal element number
	Bits 44-39:	Number of values (m) following this word
	Bits 38-27:	Direct loads internal case number
	Bits 26-24:	= 0 if distributed load direction is given in global coordinates = 1 if distributed load direction is given in element local coordinate system = n if element is a brick where n is the surface number
	Bits 23-9:	Input record number
	Bits 8-0:	Pointer to the column in the matrix LEDIRba which gives the direction of the distributed load
Item 2-m+1:	Distributed load values	

Generation: Program NTRLUDE of the loads data preprocessor.

ELEMENT LOAD DIRECTION MATRIX

File: DATARNF

Index Name: LEDIRba

Type: MIXED

Dimensions: 3 * N where N = number of load directions for element loading

Auxiliary ID:

Word 1:	DATARNF
Word 2:	LEDIRba
Words 3-10:	Zero

Elements: Column k contains either:

Item i: The i-th component of the k-th vector defining a direction of action of applied element distributed loading. This is normalized.

Item 1: Or the user node number whose components define a direction of action of applied element distributed loading.

Item 2: 4RNODE

Item 3: Zero

Generation: Program NTRLUDE of the loads data preprocessor.

LOADCASE CORRESPONDENCE TABLE WITHOUT TEXT STRING

File:	DATARNF	
Index Name:	LLCØØba	
Type:	MIXED	
Dimensions:	N*1 where N is the number of load cases.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	LLCØØba
	Words 3-10:	Zero
Elements:	Item j contains the locad case ID corresponding to internal load case j.	
Generation:	Program COOR of the loads module.	

DIRECT NODAL LOADS MATRIX

File:	DATARNF
Index Name:	LN001ba, LN002ba, ..., LN999ba
Type:	MIXED
Dimensions:	N * 1 where N ≤ block size (default 3000)
Auxiliary ID:	Word 1: DATARNF Word 2: The matrix index name Words 3-10: Zero
Elements:	This matrix is a set of word pairs (stored in input order).

Item i:	Bits 59-48:	Direct loads internal case number
	Bits 47-36:	Internal node number
	Bits 35-30:	Freedom number
	Bits 29-15:	Input record number
	Bits 14-9:	Reserved
	Bits 8-0:	Internal local coordinate system number in which load was input (0=global)
Item i+1:	Value of the nodal load.	

Generation: Program NTRLUDE of the loads data preprocessor.

NODAL THERMAL LOAD INDEX TABLE

File:	DATARNF	
Index Name:	LNTLTba	
Type:	MIXED	
Dimensions:	N*1 where N = (number of nodes +1)/2	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	LNTLTba
	Words 3-10:	Zero
Elements:	Row i consists of:	
	Bits 59-50:	BLK for node i
	Bits 49-30:	PTR for node i
	Bits 29-20:	BLK for node N+i
	Bits 19-0:	PTR for node N+i
	Where PTR = row within block of LT----- where thermal loads are written for this node	
	and BLK = block of LT----- where thermal loads are written for this node	
Generation:	Program NTRLUDE of the loads data preprocessor.	

ROTATIONAL INERTIA LOADS MATRIX

<u>File</u>: DATARNF

<u>Index Name</u>: LRØTNba

<u>Type</u>: MIXED

<u>Dimensions</u>: 3 * N where N = number of rotation load cases input

<u>Auxiliary ID</u>:

Word 1:	DATARNF
Word 2:	LRØTNba
Words 3-10:	Zero

<u>Elements</u>

Column i contains the rotation definition for the i-th input inertia load case.

Row 1:

Bits 59-48	Internal load case number
Bits 47-33	Internal node number NN1
Bits 32-18	Internal node number NN2
Bits 17-0	Reserved

Row 2:

Omega: The angular velocity

Row 3:

Alpha: The angular acceleration

Where NN1 and NN2 define the axis of rotation.

<u>Generation</u>: Program NTRLUDE of the loads data preprocessor.

NODAL THERMAL LOAD MATRIX

File:	DATARNF
Index Name:	LT001ba, LT002ba, ..., LT999ba
Type:	REAL
Dimensions:	N * NLCT where NLCT = number of thermal load cases and N = (block size)/NLCT. Default block size is 3000.
Auxiliary ID:	Word 1: DATARNF Word 2: The matrix index name Words 3-10: Zero
Elements:	Row i contains the thermal loads for the i-th internal node with thermal loading. Column j contains the thermal loads for the j-th thermal load case.
Generation:	Program NTRLUDE of the loads data preprocessor.

THERMAL LOAD CASE CORRESPONDENCE TABLE

File:	DATARNF
Index Name:	LTLCCba
Type:	MIXED
Dimensions:	NLCT * 1 where NLCT = number of load cases with thermal loads.
Auxiliary ID:	Word 1: DATARNF Word 2: LTLCCba Words 3-10: Zero
Elements:	Row i contains the internal load case number for the i-th loadcase with thermal loads. This matrix is assembled in the thermal load data input order.
Generation:	Program NTRLUDE of the loads data preprocessor.

ELEMENT THERMAL LOADS MATRIX

File: DATARNF

Index Name: LU001ba, ..., LU999ba

Type: MIXED

Dimensions: N*1 where N ≤ 3000

Auxiliary ID:

Word 1:	DATARNF
Word 2:	The matrix index name
Words 3-10:	Zero

Elements: For each thermally loaded element there is a block of data in internal element order. These blocks are as follows.

Item i:

Bits 59-45:	Internal element number
Bits 44-30	Element type
Bits 29-15:	NLC, Number of load cases
Bits 14-0:	User element number

Followed by NLC strings formated as follows:

Item i+1

Bits 59-45:	Internal loadcase number
Bits 44-30:	Number of thermal loads - NT
Bits 29-15:	Future use
Bits 14-0:	Input record number

Item (i+2)-(NT+1):

Thermal loads

Generation: Program NTRLUDE of the loads data preprocessor

ELEMENT THERMAL LOAD CORRESPONDENCE

File:	DATARNF
Index Name:	LUX01ba,,,LUX99ba
Type:	MIXED
Dimensions:	N*1 where N equals number of elements with element thermal loading ≤ 3000

Word 1: DATARNF
Word 2: The matrix index name
Words 3-10: Zero

Elements: Each item contains pointers to the LU----- matrix

Bits 59-45: Internal element number

Bits 44-30: LU----- block number

Bits 29-15: Number of words for this element

Bits 14-0: Pointer to the first word of data

Generation: Program NTRLUDE of the loads data preprocessor

CONCENTRATED MASS DATA MATRICES

File: DATARNF

Index Name: MCMASga

Type: MIXED

Dimensions: NM*9 where NM equals the number of concentrated masses in the corresponding concentrated mass data subset.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	MCMASga
Words 3-10:	Zero

Elements: Row K contains the following data for the K-th concentrated mass.

Item 1: Name of the concentrated mass

Item 2: Nodes describing the mass location:

Bits 59-36:	Not used
Bits 35-30:	Output local coordinate system number.
Bits 29-15:	The internal node number of the mass offset
Bits 14-0:	The internal node number that locates the mass center of gravity

Item 3: Weight

Item 4-9: Inertia data about the cg node. (IXX, IYY, IZZ, IXY, IXZ, IYZ)

Generation: Program MASPREP of the mass data preprocessor.

UNIQUE CONCENTRATED MASS NODES

File:	DATARNF
Index Name:	MCMNØDa
Type:	MIXED
Dimensions:	N * 1 where N equals the number of unique concentrated mass nodes.
Auxiliary ID:	Word 1: DATARNF Word 2: MCMNØDa Words 3-10: Zero
Elements:	Row K contains the user node number which locates the K-th concentrated mass.
Generation:	Program MASSMAT of the mass data preprocessor.

CONDITION DATA MATRIX

File: DATARNF

Index Name: MCØNDTa

Type: MIXED

Dimensions: CN * 5 where CN is equal to the total number of mass matrices requested.

Auxiliary ID:
Word 1: DATARNF
Word 2: MCØNDTa
Words 3-10: Zero

Elements: Each row of the condition data matrix contains the following information:

Item 1: Condition paneling code

BX = Lumped mass grid "X", where "X" is the display code equivalent to the 6 bit integer corresponding to the execution stage number.

CX = Auxiliary panel subset "X", where "X" equals the subset number assigned the auxiliary paneling scheme for this condition.

Item 2: Mass matrix index name

Item 3: Fuel distribution code for this condition

Item 4: Payload distribution code for this condition

Item 5: Concentrated mass code for this condition.

Generation: Program MASPREP of the mass data preprocessor.

FUEL CONDITION ATTITUDE MATRIX

File: DATARNF

Index Name: MFATUDa

Type: MIXED

Dimensions: 10*N where N is the number of attitudes

Auxiliary ID:

Word 1:	DATARNF
Word 2:	MFATUDa
Words 3-10:	Zero

Elements: Column i contains data for the ith attitude.

Item 1:	A	Coefficients of the fuel plane equation AX + BY + CZ = 0
Item 2:	B	
Item 3:	C	
Item 4:	Roll angle	
Item 5:	Pitch angle	
Item 6:	Yaw angle	
Item 7:	X	Coordinates of the rotation point
Item 8:	Y	
Item 9:	Z	
Item 10:	The attitude number (integer)	

Generation: Program MASSFG of the fuel generation preprocessor.

FUEL CONDITION DATA MATRIX

File:	DATARNF	
Index Name:	MFCØNDa	
Type:	MIXED	
Dimensions:	2*N where N is the number of fuel conditions.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	MFCØNDa
	Words 3-10:	Zero
Elements:	The ith column contains the data for the ith fuel condition.	
Item 1:	Bits 59-40:	Pointer to column in MFATUDa for attitude.
	Bits 39-20:	Sequence number
	Bits 19-0:	Condition number
Item 2:	Weight	
Generation:	Program MASSFG of the fuel generation preprocessor.	

FUEL MANAGEMENT LOADING MATRIX

File: DATARNF

Index Name: MFLØADa

Type: MIXED

Dimensions: N*1 where N varies depending on the number of fuel management load commands.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	MFLØADa
Words 3-10:	Zero

Elements:

Item 1: Number of sequences.

Item 2-N: The data for each sequence is in a block as follows:

Word 1:	Bits 59-30:	Sequence ID
	Bits 29-0:	Number of load commands for this sequence.

The data blocks for each load command within this sequence follow the first word: (5 words per load command)

Word 1:	Bits 59-45:	First tank ID
	Bits 44-30:	Second tank ID
	Bits 29-15:	Third tank ID
	Bits 14-9:	Not used
	Bits 8-6:	Number of tanks loaded in this command
	Bits 5-3:	Option number (1,2, or 3)
	Bits 2-0:	Number 1

Word 2-4: Relative loading rates for tanks 1, 2, and 3.

Word 5: Tank ID - option 1
Weight - option 2
Total weight - option 3

<u>Generation</u>: Program MASSFG of the fuel generation preprocessor

FUEL MANAGEMENT USAGE MATRIX

File: DATARNF

Index Name: MFMUSEa

Type: MIXED

Dimensions: N*1 where N varies depending on the number of fuel management usage commands.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	MFMUSEa
Words 3-10:	Zero

Elements:

Item 1: Number of sequences

Items 2-N: The data for each sequence is in a block as follows:

Word 1:	Bits 59-30:	Sequence ID
	Bits 29-0:	Number of use and transfer commands for this sequence.

The data blocks for each command within this sequence follow the first word. (5-9 words per usage command, 2 words per transfer command)

Usage command:

Word 1:	Bits 59-45:	First tank ID
	Bits 44-30:	Second tank ID
	Bits 29-15:	Third tank ID
	Bits 14-9:	Not used
	Bits 8-6:	Number of tanks used in this command

	Bits 5-3:	Option number (1, 2, 3, or 4)
	Bits 2-0:	Number 2

Words 2-4:

Relative using rates for tanks 1, 2, 3

Word 5: Weight - options 1 and 2

4-15 bit packed tank idents - options 3 and 4

Word 6: Weight - option 3

Word 6-9: Weight factors - option 4

Transfer commands:

Word 1:	Bits 59-45:	First tank ID
	Bits 44-30:	Second tank ID
	Bits 29-6:	Not used
	Bits 5-3:	Option number (1 or 2)
	Bits 2-0:	Number 3

Word 2: Weight or percentage transfered

<u>Generation</u>: Program MASSFG of the fuel generation preprocessor.

CARGO HOLD GEOMETRY MATRIX

File: DATARNF

Index Name: MHØLDSa

Type: MIXED

Dimensions: N*1 where N depends on the number of cargo holds and the type of hold description.

Auxiliary ID:
Word 1: DATARNF
Word 2: MHØLDSa
Words 3-10: Zero

Elements:

Item 1: Number of cargo holds (M)

Item 2-(2*M+1):

Word 1:

Bits 59-45:	User identification
Bits 44-42:	Type code
Bits 41-36:	Reserved
Bits 35-30:	Number of hold sections
Bits 29-15:	Reserved
Bits 14-0:	Pointer to the hold geometry data.

Word 2: Density

Item (2*M+2)-N:

Hold geometry data, i words per section

Word 1:

Bits 59-21:	Reserved
Bits 20-6:	Section identification
Bits 5-0:	Number of nodes.

Words 2-i Contain 4 packed 15 bit internal node numbers describing each section.

<u>Generation</u>: Program MASSPL of the payload generation preprocessor.

WEIGHT STATEMENT LABEL DATA

File:	DATARNF	
Index Name:	MLABELa	
Type:	MIXED	
Dimensions:	N * 5 where N equals the number of defined weight statement labels.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	MLABELa
	Words 3-10:	Zero
Elements:	Row K contains the level identification and label for the K-th item of the weight statement.	
Item 1:	Level identification	
	Bits 59-6:	The subset name or level indicator (display code)
	Bits 5-3:	Element component indicator (integer) 0 = all components 1 = upper spar caps and cover plates 2 = lower spar caps and cover plates 3 = spar webs
	Bits 2-0:	Level (integer)
Item 2-5:	Weight statement label	
Generation:	Program MASPREP of the mass data preprocessor.	

MASS ELEMENT CORRESPONDENCE TABLE

File: DATARNF

Index Name: MLCT00a

Type: MIXED

Dimensions: M * 1 where M is the number of mass elements

Auxiliary ID:

Word 1:	DATARNF
Word 2:	MLCT00a
Words 3-10:	Zero

Elements: A typical row (i) contains 4 packed 15 bit integers, (J), (K), (L), and (M) described as follows:

Bits 59-45:	(J) input sequence number corresponding to internal element (i)
Bits 44-30:	(K) internal element number corresponding to input sequence (i)
Bits 29-15:	(L) user element numbers stored in increasing order
Bits 14-0:	(M) internal element number corresponding to user element number (L)

Generation: Program MASSMAT of the mass data preprocessor.

MASS LUMPING DATA

File: DATARNF

Index Name: MLUMP0a

Type: MIXED

Dimensions: N*1 where N depends on the number of subsets referenced.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	MLUMP0a
Words 3-10:	Zero

Elements: The data for each referenced node subset is stored in a block as follows, one word per subset.

Bits 59-12: The subset type (display code)

5LNØDES
4LFUEL
7LPAYLØAD
4LSTIF
4LMASS

Bits 11-0: The subset number (integer)

Generation: Program MASSPAN of the mass data preprocessor.

MASS ELEMENT NODAL MATRIX

File:	DATARNF
Index Name:	MMELNØa
Type:	MIXED
Dimensions:	M * 1 where

$$M = 1 + L + \sum_{i=1}^{L} (Ni + 4)/5$$

L = number of mass elements,

N = number of nodes describing element i (≥ 1)

Auxiliary ID:	Word 1:	DATARNF
	Word 2:	MMELNØa
	Words 3-10:	Zero

Elements:

Item 1:	Bits 59-15:	Not used at present
	Bits 14-0:	Number of mass elements
Item 2-L+1:	Contain 5 packed numbers of identifiers as:	
	Bits 59-54:	Element code (integer)
	Bits 53-47:	Number of nodes (integer)
	Bits 46-30:	Reserved for future use
	Bits 29-15:	Element user number (integer)
	Bits 14-0:	Pointer (within this matrix) to packed nodes for this element (integer)

Item L+2-M: Contains up to 5 packed 12 bit integers per word, representing the internal nodes for a particular element. For each element, this information starts in the left-most position of the word defined by the pointer of this element and uses as many words as needed by the number of nodes. For all words a fill left to right is employed. Unused bits are zero filled.

Generation: Program MASSMAT of the mass data preprocessor.

AUXILIARY PANEL DATA MATRIX

File:	DATARNF	
Index Name:	MPANLha	
Type:	MIXED	
Dimensions:	NPj * 3	
	where NPj equals the number of panels in the j-th panel data subset.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	MPANLha
	Words 3-10:	Zero
Elements:	Row K contains the description of the K-th panel.	
Item 1:	Panel identification word as follows:	
	Bits 59-45:	Internal node number defining panel direction or the global direction indicator (1, 2, or 3)
	Bits 44-39:	Internal number of the output local coordinate system
	Bits 38-33:	Number of words in MPSETha
	Bits 32-21:	Pointer to row of MPSETha
	Bits 20-0:	Panel identification (integer)
Item 2-3:	Internal node numbers defining the panel, 4 packed 15 bit integers.	
Generation:	Program MASSPAN of the mass data preprocessor.	

MASS MODULE CONTROL DATA

File:	DATARNF
Index Name:	MPARMS1
Type:	MIXED
Dimensions:	50 * N where N is the largest defined mass data set number.
Auxiliary ID:	Word 1: DATARNF Word 2: MPARMS1 Words 3-10: Zero
Elements:	The i-th column contains the following data for mass data set i:
Item 1:	Number of mass matrices requested
Item 2-4:	Reserved
Item 5:	Number of mass element matrices
Item 6:	Total number of mass elements
Item 7-10:	Reserved
Item 11:	Number of payload subsets
Item 12:	Number of fuel subsets
Item 13:	Number of concentrated mass subsets
Item 14-15:	Reserved
Item 16:	Number of node subsets for lumping
Item 17:	Number of execution stages
Item 18:	Number of auxiliary panel geometry matrices
Item 19-21:	Number of panels in each auxiliary panel matrix (3 packed 20 bit integers per word)
Item 22:	Reserved

Item 23: MPSETha matrix indicator, rightmost 9 bits

Bit 0: Auxiliary panel subset 1

Bit 1: Auxiliary panel subset 2

.
.
.
.

Bit 8: Auxiliary panel subset 9

0 = no MPSETha matrix defined
1 = MPSETha matrix is defined

Item 24: Reserved

Item 25: Number of grid nodes to consider at each retained node

Item 26: Reserved

Item 27: Stiffness element switch

0 - stiffness elements are not included in the mass calculations
1 - stiffness elements are included

Item 28: Number of weight correction factors

Item 29: Number of weight statement labels

Item 30: Number of unique concentrated mass points

Item 31: Mass matrix divisor factor

Item 32: Reserved

Item 33: Mass matrix grid radius

Item 34: Mass element switch

Item 35-50: Reserved

<u>Generation</u>: Program MASSMAT of the mass data preprocessor

PAYLOAD CONDITIONS MATRIX

File:	DATARNF	
Index Name:	MPCØNDa	
Type:	MIXED	
Dimensions:	2*N, where N is the number of payload conditions	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	MPCØNDa
	Words 3-10:	Zero
Elements:		
Item 1:	Bits 59-40:	Number of passengers
	Bits 39-20:	Sequence identification
	Bits 19-0:	Condition identification
Item 2:	Cargo weight	
Generation:	Program MASSPL of the payload generation preprocessor.	

PAYLOAD LOADING DATA

File: DATARNF

Index Name: MPLØADa

Type: MIXED

Dimensions: N*1 where N depends on the number of loading sequences and the type of command within each sequence.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	MPLØADa
Words 3-10:	Zero

Elements:

Item 1: The number of loading sequences (integer)

Item 2-N: The data for each loading sequence is stored in a block as follows:

Word 1:

Bits 59-51:	Sequence identification
Bits 50-36:	Pointer to next block of loading data.
Bits 35-24:	Number of seats loaded.
Bits 23-15:	Number of cargo load commands.
Bits 14-0:	Pointer to the cargo commands.

Word 2-i: 4 packed 15 bit seat numbers per word stored left to right in the order of loading (i-1 words)

Word (i+1)-j:

Cargo loading data, one or two words for each loading command.

Bits 59-45:	Cargo hold identification
Bits 44-6:	Reserved
Bits 5-3:	Local direction flag (1=+x, 2=-x,3=+y,4=-Y,5=+z,6=-z)
Bits 2-0:	Option code

The following word contains the cargo weight, if specified.

Generation: Program MASSPL of the payload generation preprocessor.

SEAT LOCATION-LOCAL COORDINATE SYSTEMS MATRIX

File: DATARNF

Index Name: MPLØCLa

Type: MIXED

Dimensions: 13 * N where N is the number of local coordinates systems.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	MPLØCLa
Words 3-10:	Zero

Elements: A typical column j contains the following information pertaining to local coordinate system j.

Item 1:

- Bits 59-18: Local coordinate system user ID Display code left-adjusted, blank-filled.
- Bits 17-0: The characters (BCD) CYL, SPH, or REC to indicate the type of coordinate system (cylindrical, spherical, or rectangular).

Item 2-4: Global coordinates of local origin (x, y, z).

Item 5-13: Elements of the 3x3 transformation matrix, t, that transforms a global representation to a local V(local)=t V(global)

The order of the elements is t11,t21,t31,t12,...., t33.

Generation: Program MASSPL of the payload generation preprocessor.

SEAT LOCATION CORRESPONDENCE TABLE

File: DATARNF

Index Name: MPNØCTa

Type: MIXED

Dimensions: N*1 where N=5+(highest user seat number-lowest user seat number)/50+number of seats.

Auxiliary ID: Zero

Elements:

Item 1: A number (N) ≤ lowest seat number, N=M*60+1 where M = (smallest user seat number -1)/60

Item 2: Highest user seat number

Item 3: Pointer to start of Block 2

Item 4: Pointer to start of Block 3

Item 5-X: Block 1 where X = (item 2-item 1)/60+5

Table to indicate the presence of user id. Bit 59 in the first word corresponds to the number in item 1. Successive bits represent sequentially increasing seat numbers. If a bit is "on" the number represented by it is a user seat number.

Item X+1-Y: Block 2 where Y = ((X-3)/4+1) +X

Each word contains 4 packed 15 bit numbers each of which was a value equal to the cumulative sum of all the "on" bits up to but not including the corresponding word in Block 1. Thus the first word in Block 2 contains the sums for the first 4 words in Block 1 and so on.

Item Y+1-Y+n:

Block 3 where N = number of seats

A typical row Y+i contains 3 packed 20 bit integers as follows:

Bits 59-40: The user seat number, (j), corresponding to the internal seat number (i):

Bits 39-20: Pointer, (K), to the seat location data matrix. Row (K) of the seat location data matrix contains thhe coordinates of internal seat (i), user seat (j):

Bits 19-0: The internal seat number, (m), corresponding to the user seat number represented by the i-th "on" bit in Block 1.

Generation: Program MASSPL of the payload generation preprocessor.

SEAT LOCATION DATA MATRIX

File:	DATARNF	
Index Name:	MPNØDMa	
Type:	MIXED	
Dimensions:	M*4 where N equals the number of seats.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	MPNØDMa
	Word 3:	Passenger weight
	Words 4-9:	IXX,IYY,IZZ,IXY,IXZ,IYZ
	Word 10:	Zero
Elements:	A typical row of the seat location data matrix contains:	
Item 1:	Bit 59:	Reserved for future use.
	Bits 58-47:	Input sequence number of the seat.
	Bits 46-41:	Input local coordinate system.
	Bits 40-35:	Reserved for future use.
	Bits 34-20:	Input record number of the seat.
	Bits 19-0:	User seat number.
Item 2:	Seat X coordinate	
Item 3:	Seat Y coordinate	
Item 4:	Seat Z coordinate	

The data for seat n does not necessarily appear in row n of the seat location data matrix. The seat location correspondence table must be referenced to obtain the seat-row correspondence

Generation: Program MASSPL of the payload generation preprocessor.

MASS PANEL SUBSET MATRIX

File: DATARNF

Index Name: MPSETha

Type: MIXED

Dimensions: N*1 where N is variable but limited to a maximum of 63 words per panel in the corresponding auxiliary panel set.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	MPSETha
Words 3-10:	Zero

Elements: MPSETha is organized into blocks of element subset numbers. Each block is referenced by the panels in the corresponding auxiliary panel set, and is organized as follows:

Item 1:

Bits 59-48: Fuel - Payload indicator

- Bit 54
  - 1 indicates fuel elements
  - 0 indicates no fuel elements
- Bit 48
  - 1 indicates payload elements
  - 0 indicates no payload elements

Bits 47-0: Contain 4 12-bit subset indicators as follows:

- Bits 11-10: Subset indicator as follows:
  - Mass Subset=00
  - Stiffness Subset=01
  - Mixed Subset=11
- Bits 9-0: Subset number

Item 2-M: 5 packed 12-bit subset indicators as described above.

Generation: Program MASSPAN of the mass data preprocessor.

MASS ELEMENT, FUEL, AND PAYLOAD ELEMENT DATA

File:	DATARNF
Index Name:	MSF001a, MSF002a, ..., MSF999a (Mass Elements), MLØDppa (Payload elements) MFULffa (Fuel elements)
Type:	MIXED
Dimensions:	M * 1 where M is variable depending on the number of elements. The mass elements are stored in blocks of 3000 words or less. The fuel and payload elements are stored in a single block of 5000 words or less per matrix.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	Matrix index name
Word 3:	The total number of elements in this data block
Words 4-10:	Zero

Elements: The following element data is stored consequently beginning in row 1 with internal element 1. The data for the remaining elements follows in increasing internal element order.

Item 1:

Bits 59:	1 if tapered plate or cover
Bits 58-54:	The element type code
Bits 53-47:	The number of nodes describing the elements
Bits 46-45:	The element input format code
Bits 44-30:	The element input record number
Bits 29-15:	The element user number
Bits 14-0:	The element internal number

Item 2: The element alphanumeric label

Item 3-n: The element properties as follows:

Rod, format 1 -	Density Area at node 1 Area at node 2
Rod, format 2 -	Weight Area at node 1 Area at node 2
Rod, format 3 -	Weight Area at node 1 Area of node 2
Beam, format 1 -	Density Area at node 1 Torsional constant at node 1 Area moment about local Y at node 1 Area moment about local Z at node 1 Area at node 2 Torsional constant at node 2 Area moment about local Y at node 2 Area moment about local Z at node 2
Beam, format 2 -	Weight Area at node 1 Torsional constant at node 1 Area moment about local Y at node 1 Area moment about local Z at node 1 Area at node 2 Torsional constant at node 2 Area moment about local Y at node 2 Area moment about local Z at node 2
Beam, format 3 -	Weight Area at node 1 Torsional constant at node 1 Area moment about local Y at node 1 Area moment about local Z at node 1 Area at node 2 Torsional constant at node 2 Area moment about local Y at node 2 Area moment about local Z at node 2
Spar -	Web Thickness Density Upper cap area at node 1 Lower cap area at node 1 Upper cap area at node 2 Lower cap area at node 2

Cover, format 1-	Upper Thickness	
	Upper Density	
	Lower Thickness	
	Lower Density	
Cover, format 2-	Upper Weight	
	Lower Weight	
	Upper Thickness	
	Lower Thickness	
Cover, format 3-	Upper Weight	
	tu1	
	tu2	
	tu3	
	(tu4)	
	Lower Weight	
	tl1	
	tl2	
	tl3	
	(tl4)	
Plate, format 1-	Density	
	Thickness	
Plate, format 2-	Weight	
	Thickness	
Plate, format 3-	Weight	
	t1	
	t2	
	t3	
	(t4)	
Scalar mass -	Weight (IXX, IYY, IZZ, IXY, IXZ, IYZ)	

Item (n+1)-(N+M):

The internal node numbers describing the element. The nodes are stored as 4 packed 15 bit integers per word, m words total.

Generation: Program MASSEL of the mass data preprocessor.

FUEL TANK DATA MATRIX

File: DATARNF

Index Name: MTANKSa

Type: MIXED

Dimensions: N * 1 where N varies depending on the number and type of tanks

Auxiliary ID:

Word 1:	DATARNF
Word 2:	MTANKSa
Words 3-10:	Zero

Elements:

Item 1: Number of tanks (M)

The next 3M items are used in groups of 3 words per tank for the i-th tank

Item 1+3(i-1)+1:

Bits 59-45:	User identification
Bits 44-42:	Type code (0 polygon, 1 brick)
Bits 41-36:	Number of fuel levels
Bits 35-30:	Number of sections
Bits 29-15:	Reserved
Bits 14-0:	Pointer to section data

Item 1+3(i-1)+2:

Density

Item 1+3(i-1)+3:

Percent tank usable.

The remaining items contain the section data

Pointer word:

Bits 59-21: Reserved

Bits 20-6: Section Identification

Bits 5-0: Number of nodes in this section

Pointer word +1-j:

4-15 Bit internal node numbers per word (as many words as needed for this section)

Generation: Program MASSFG of the fuel generation preprocessor.

ELEMENT WEIGHT FACTORS

File:	DATARNF
Index Name:	MWTFACa
Type:	MIXED
Dimensions:	N * 2 where N equals the number of element subsets that are to be factored.
Auxiliary ID:	Word 1: DATARNF Word 2: MWTFACa Words 3-10: Zero
Elements:	Row K contains the following data for the K-th subset to be factored.
Item 1:	Subset identification, SEKddda--i, SEMddda--i, FUEL----ff,or PAYLOAD-pp where i is the component indicator: 0 = all components 1 = upper spar caps and cover plates 2 = lower spar caps and cover plates 3 = spar webs
Item 2:	Subset weight factor (floating point) or Bits 59-6: Zero Bits 5-0: Factor table identifier (integer)
Generation:	Program MASPREP of the mass data preprocessor.

WEIGHT FACTOR TABLE MATRIX

File:	DATARNF	
Index Name:	MWTFTta	
Type:	MIXED	
Dimensions:	M*1 where M = 2* number of table values + number of constants + 1	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	MWTFTta
	Words 3-10:	Zero

Elements:

Item 1:	Bits 59-54:	Equation type (integer)
	Bits 53-48:	First property indicator (integer)
	Bits 47-42:	Second property indicator (integer)
	Bits 41-36:	Third property indicator (integer)
	Bits 35-30:	Reserved
	Bits 29-27:	First operation indicator (integer)
	Bits 26-24:	Second operation indicator (integer)
	Bits 23-21:	Third operation indicator (integer)
	Bits 20-15:	Reserved
	Bits 14-6	Number of table values (NV)
	Bits 5-0:	Number of equation constants (NC)

Item 2-(NC+1):

Constants

Item (NC+2)=(NC+NV+1):

Table values

Item (NC+NV+2)-M:

Factor values

Generation: Program MASPREP of the mass data preprocessor

COMPRESSION ALLOWABLES TABLE

File: DATARNF

Index Name: NALLØWC

Type: MIXED

Dimensions: M*1, where $M = N + 2 \sum_{i=1}^{N} NEi$.

N equals the number of tables and NEi equals the number of gage entries for table i. There is also NEi compression allowable stress entries for table i.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	NALLØWC
Word 3:	Number of tables (N)
Words 4-10:	Zero

Elements:

Item 1-N:

Bits 59-45:	Allowable table code (integer). The same material 1, 2, ..., varying temp. 10, 11, ..., 19, 20, 21, ...29,
Bits 44-30:	Temperature +500 (degrees Fahrenheit) (integer)
Bits 29-22:	NT, number of temperatures (integer)
Bits 21-15:	NE, number of entries (integer)
Bits 14-0:	POINT, pointer to data (integer)

Item (N+1)-(N+NEi):

Gage (real)

Item (N+NEi+1)-(N+2NEi):

Compression allowable stress (real)

Item (N+2NEi+1)-M:

Repeat for balance of tables

Generation: Program DESINPT of the design data preprocessor.

SHEAR ALLOWABLES TABLE

File: DATARNF

Index Name: NALLØWS

Type: MIXED

Dimensions: M*1, where $M = N+2 \sum_{i=1}^{N} NEi$.

N equals the number of tables and NEi equals the number of gage entries for table i. There is also NEi shear allowable stress entries for table i.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	NALLØWS
Word 3:	Number of tables (N)
Words 4-10:	Zero

Elements:

Item 1-N:

Bits 59-45:	Allowable table code (integer) The same material 1, 2, ..., varying temp. 10, 11, ... 19, 20, 21, ... 29
Bits 44-30:	Temperature +500 (degrees Fahrenheit (integer)
Bits 29-22:	NT, number of temperatures (integer)
Bits 21-15:	NE, number of entries (integer)
Bits 14-0:	POINT, pointer to data (integer)

Item (N+1)-(N+NEi):

Gage (real)

Item (N+NEi+1)-(N+2NEi):

Shear allowable stress (real)

Item (N+2NEi+1)-M:

Repeat for balance of tables

Generation: Program DESINPT of the design data preprocessor.

BUCKLING INTERACTION DATA MATRIX

File:	DATARNF	
Index Name:	NBI001a, NBI002a, .., NBI999a	
Type:	MIXED	
Dimensions:	M*1, where M ≤ 3100	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	The matrix index name.
	Words 3-10:	Zero

Elements:

Item 1:	Bits 59-30:	Reserved
	Bits 29-15:	NF, number of elements contained in this partition (integer).
	Bits 14-0:	NBEG, number (internal) of first element in this partition (integer).
Item 2-(NF+1):		
	Bits 59-54:	EC, the element code (integer).
	Bits 53-15:	Reserved for future use.
	Bits 14-0:	POINT, pointer to the body of buckling interaction data. (integer)
Item (NF+2)-M:		
	Buckling interaction data (real), six entries per element.	

Generation: Program DESINPT of the design data preprocessor.

BUCKLING TABLES INDEX MATRIX

File: DATARNF

Index Name: NBUCTAB

Type: MIXED

Dimensions: 100 * 2

Auxiliary ID:

Word 1:	DATARNF
Word 2:	NBUCTAB
Words 3-10:	Zero

Elements:

Column 1: Row k contains the number of temperatures in compression allowables table NALLØWC for material k.

Column 2: Row k contains the number of temperatures in shear allowables table NALLØWS for material k.

Generation: Program DESINPT of the design data preprocessor.

DESIGN LOAD CONTROL MATRICES

File: DATARNF

Index Name: NC001ba, NC002ba, ..., NC999ba

Type: MIXED

Dimensions: M*1, where M = (NF+59)/60, and NF equals the number of elements in the corresponding NLxxxba matrix partition.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	The matrix index name.
Words 3-10:	Zero

Elements:

Item 1-M-1: Zero (integer)

Item M 2^{K-1} (integer) where K=NF-(M-1)*60. This is a bit flag for the last element in the corresponding NLxxxba matrix partition.

Generation: Program DESINPT of the design data preprocessor.

THERMAL DESIGN LOAD CONTROL MATRIX

File: DATARNF

Index Name: ND001ba, ND002ba, ..., ND999ba

Type: MIXED

Dimensions: M*1, where M = (NF+59)60, and NF equals the number of elements in the corresponding NTxxxba matrix partition.

Auxiliary ID: Word 1: DATARNF Word 2: The matrix index name Words 3-10: Zero

Elements:

Item 1-M-1: Zero (integer)

Item M 2^{K-1} (integer), where K=NF-(M-1)*60. This is a bit flag for the last element in the corresponding NTxxxba matrix partition.

Generation: Program DESINPT of the design data preprocessor.

DESIGN LOAD CASE MATRIX

File: DATARNF

Index Name: NDLCRba

Type: MIXED

Dimensions: M*3, where M is the maximum number of design load cases (NDLC) plus 3 times the maximum number of superposition load cases (3*NSLC).

Auxiliary ID:

Word 1:	DATARNF
Word 2:	NDLCRba
Word 3:	NDLC
Word 4:	NDL, the number of design load cases used.
Word 5:	NSL, the number of superposition load cases used.
Words 6:	NSC, the number of non-design ingredient loadcases used in superposition.
Words 7-10:	Zero

Elements: Column 1 contains the following data:

Item 1-NDL: Internal load case number (integer)

Item (NDL+1)-NDLC:

Zero (integer)

Item (NDLC+1)-(NDLC+NSC):

Internal load case number (integer)

Item (NDLC+NSC+1)-M:

Zero

Column 2 contains the following data:

Item 1-NDL: User label for design load cases (integer)

Item (NDL+1)-NDLC:

Zero

Item (NDLC+1)-(NDLC+NSC):

User label for non-design ingredient load cases of superposition load cases.

Item (NDLC+NSC+1)-(NDLC+2*NSLC):

Zero

Item (NDLC+2*NSLC+1)-(NDLC+2*NSLC+NSL):

User label for superposition load cases.

Item (NDLC+2*NSLC+NSL+1)-M:

Zero

Column 3 contains the following data:

Item 1-NDL: Ultimate/limit data, (0=ultimate, 1-limit) for corresponding load case (integer).

Item (NDL+1)-(NDLC+2*NSLC):

Zero

Item (NDLC+2*NSLC+1)-(NDLC+2*NSLC+NSL):

Ultimate/limit data, (0=ultimate, 1=limit) for corresponding load case (integer).

Item (NDCL+2*NSLC+NSL+1)-M:

Zero

Generation: Program DESINPT of the design data preprocessor.

ELASTICITY MODULUS TABLE

File: DATARNF

Index Name: NEMØDUL

Type: MIXED

Dimensions: M*1, where $M = N+2 \sum_{i=1}^{N} NEi$.

N equals the number of tables and NEi equals the number of stress entries for table i. There is also NEi elasticity modulus entries for table i.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	NEMØDUL
Word 3:	Number of tables (N)
Words 4-10:	Zero

Elements:

Item 1-N:

Bits 59-45:	Modulus table code (integer). The same material 1, 2, ..., varying temp. 10, 11, ..., 19, 20, 21, ... 29.
Bits 44-30:	Temperature +500 (degrees Fahrenheit) (integer)
Bits 29-22:	NT, number of temperatures (integer)
Bits 21-15:	NE, number of entries (integer)
Bits 14-0:	POINT, pointer to data (integer)

Item (N+1)-(N+NEi):

Stress (real)

Item (N+NEi+1)-(N+2NEi):

Elasticity modulus (real)

Item (N+2NEi+1)-M:

Repeat for balance of tables

Generation: Program DESINPT of the design data preprocessor.

SHEAR MODULUS TABLE

File: DATARNF

Index Name: NGMØDUL

Type: MIXED

Dimensions: M*1, where $M = N+2 \sum_{i=1}^{N} NEi$.

N equals the number of tables and NEi equals the number of stress entries for table i. There is also NEi shear modulus entries for table i.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	NGMØDUL
Word 3:	Number of tables (N)
Words 4-10:	Zero

Elements:

Item 1-N:

Bits 59-45:	Modulus table code (integer) The same material 1, 2, ..., varying temp. 10, 11, ... 19, 20,21, ... 29.
Bits 44-30:	Temperature +500 (degrees Fahrenheit (integer)
Bits 29-22:	NT, number of temperatures (integer)
Bits 21-15:	NE, number of entries (integer)
Bits 14-0:	POINT, pointer to data (integer)

Item (N+1)-(N+NEi):

Stress (real)

Item (N+NEi+1)-(N+2NEi):

Shear modulus (real)

Item (N+2NEi+1)-M:

Repeat for balance of tables

<u>Generation</u>: Program DESINPT of the design data preprocessor.

ELEMENT TYPE AND PARTITIONS

File:	DATARNF	
Index Name:	NITYPEa	
Type:	MIXED	
Dimensions:	M*1, where M is the number of flexible elements for the defined data set.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	NITYPEa
	Words 3-10:	Zero
Elements:	A typical row (i) contains the following packed data for internal element (i).	
	Bits 59-52:	KSFxxxx partition number.
	Bits 51-44:	NBIxxxx partition number.
	Bits 43-36:	NLxxxxx partition number.
	Bits 35-33:	Reserved.
	Bit 32:	Design property data indicator. A 1 bit indicates data was defined, a zero bit indicates it was not defined.
	Bit 31:	Design fixed data indicator. A 1 bit indicates data was defined, a zero bit indicates it was not defined.
	Bit 30:	Design upper bound data indicator. A 1 bit indicates data was defined, A zero bit indicates it was not defined.
	Bit 29:	Design lower bound data indicator. A 1 bit indicates data was defined, A zero bit indicates it was not defined.

Bit 28:	Design margin of safety data indicator. A 1 bit indicates data was defined, a zero bit indicates it was not defined.
Bit 27:	Design resize data indicator. A 1 bit indicates data was defined, A zero bit indicates it was not defined.
Bits 26-22:	Number of stiffness property values associated with this element.
Bits 21-18:	Number of lamina in upper surface if this element is a composite. Otherwise it is zero.
Bits 17-14:	Number of lamina in lower surface if this element is a composite with a lower surface. Otherwise it is zero.
Bits 13-6:	NTxxxxx partition number.
Bits 5-0:	Element type number.

Generation: Program DESINPT of the design data preprocessor.

ELEMENT CONTROL MATRICES

File: DATARNF

Index Name: NKS001a, NKS002a, ..., NKS999a. Character 7 is the display code equivalent of the 6 bit integer corresponding to the data set number.

Type: MIXED

Dimensions: M*1, where M = (NF+59)/60, and NF equals the number of elements in the corresponding KSFxxxa matrix partition.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	The matrix index name
Words 3-10:	Zero

Elements:

Item 1-M-1: Zero (integer)

Item M 2^{K-1} (integer) where K=NF-(M-1)*60. This is a bit flag for the last element in the corresponding KSF matrix partition.

Generation: Program DESINPT of the design data preprocessor.

DESIGN LOADS MATRICES

File: DATARNF

Index Name: NL001ba, NL002ba, ..., NL999ba

Type: MIXED

Dimensions: M*1, where M≤3100. M=1+NF*(1+2*NDLC+4*NSLC),NF is the number of elements in this partition, NDLC is the number of design loadcases, and NSLC is the number of superposition loadcases.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	The matrix index name
Word 3:	NDLC
Words 4-10:	Zero

Elements:

Item 1:

Bits 59-30:	Reserved for future use
Bits 29-15:	NF, number of elements contained in this matrix (integer)
Bits 14-0:	NBEG, number (internal) of the first element in this partition (integer)

Item 2-(NF+1):

Bits 59-54:	EC, the element code number (integer)
Bits 53-42:	NSL, the number of user defined superposition load cases for this element (integer)
Bits 41-30:	NDL, the number of user defined design load cases for this element (integer)
Bits 29-15:	ULABEL, the user element number (integer)
Bits 14-0:	POINT, pointer to the body of element data (integer)

Item (NF+2)-M:

Element data.

Starting with the pointer word there are NDLC pairs of words containing design loads information as follows:

Word 1:	Bits 59-9:	LF, load factor (real)
	Bits 8-0:	LC, loadcase number (integer), imbedded in right-most 9 bits of the LF WORD
Word 2:	Element temperature (real)	

Starting with the pointer word plus 2*NDLC there are NSLC sets of 4 words containing superposition loads information as follows:

Word 1:	Superposition load case number (integer)	
Word 2:	Bits 59-9:	LFS1, load factor for the first case (real)
	Bits 8-0:	LCS1, loadcase number (integer)
Word 3:	Bits 59-9:	LFS2, load factor for the second case (real)
	Bits 8-0:	LCS2, loadcase number (integer)
Word 4:	Element temperature (real)	

<u>Generation</u>: Program DESINPT of the design data preprocessor.

MATERIAL CODE REFERENCE MATRIX

File: DATARNF

Index Name: NMATERa

Dimensions: 100*3

Auxiliary ID:

Word 1:	DATARNF
Word 2:	NMATERa
Word 3:	Maximum row in column 1 with a nonzero value.
Word 4:	Number of nonzero elements in column 1.
Word 5:	Number of nonzero elements in column 2.
Word 6:	Number of nonzero elements in column 3.
Words 7-10:	Zero

Elements:

Column 1: Row K contains the integer K if material number K has been referenced during input of design data and if row K of the Material Code Matrix KMATERA contains a K.

Column 2: Row K contains the integer K if the compression table K has been referenced during input of design data and if row K, column 1 of the buckling tables index matrix NBUCTAB contains a nonzero value.

Column 3: Row K contains the integer K if the shear table K has been referenced during input of design data and if row K, column 2 of the buckling tables index matrix NBUCTAB contains a nonzero value.

Generation: Program DESINPT of the design data preprocessor.

MODULUS TABLES INDEX MATRIX

File:	DATARNF	
Index Name:	NMØDTAB	
Type:	MIXED	
Dimensions:	100 * 2	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	NMØDTAB
	Words 3-10:	Zero

Elements:

Column 1: Row k contains the number of temperatures in elasticity modulus table NEMODUL for material k.

Column 2: Row k contains the number of temperatures in shear modulus table NGMODUL for material k.

Generation: Program DESINPT of the design data preprocessor.

MARGIN OF SAFETY MATRICES

File: DATARNF

Index Name: NMS001a, NMS002a, ..., NMS999a

Type: MIXED

Dimensions: M*1, where $M = 1 + NF + \sum_{i=1}^{NF} NTOTi$

NF is the number of elements in the corresponding partition of the KSF-matrix and NTØT is the number of words required for each block (body) of element safety data. The size of NTOT is dependent on element type.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	The matrix index name
Words 3-10:	Zero

Elements:

Item 1:

Bits 59-30:	Reserved for future use
Bits 29-15:	NF, number of elements contained in this matrix (integer)
Bits 14-0:	NBEG, number (internal) of the first element in this partition (integer)

Item 2-(NF+1):

Bits 59-54:	EC, the element code (integer)
Bits 53-42:	Reserved for future use
Bits 41-39:	NU, the number of words above pointer in data body (integer)
Bits 38-30:	NTOT, total number of words in data body (integer)

Bits 29-15: ULABEL, the user element number (integer)

Bits 14-0: POINT, pointer to the body of element margin of safety data (integer)

Item (NF+2)-M:

Margin of safety data

<u>Generation</u>: Program DESINPT of the design data preprocessor

OPTIMIZATION CONTROL MATRIX

File:	DATARNF	
Index Name:	NØCNTRa	
Type:	MIXED	
Dimensions:	M*1, where M is number of optimization problems to be solved.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	NØCNTRa
	Words 3-10:	Zero
Elements:		
Item 1-M:	Bits 59-54:	MTYPE, element type.
	Bits 53-42:	ELID1, identity of subset 1. (0 indicates whole structure)
	Bits 41-30:	ELID2, identity of subset 2
	Bits 29-15:	Partition number of matrix NODxxxx containing problem data block.
	Bits 14-0:	Pointer to location of data block in NODxxxx.
Generation:	Program DESINPT of the design data proprocessor.	

VARIABLE CONSTRAINTS CONTROL MATRIX

File:	DATARNF	
Index Name:	NØDVCCa	
Type:	MIXED	
Dimensions:	M*1, where M is the number of optimization problems which can be constrained.	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	NØDVCCa
	Words 3-10:	Zero
Elements:		
Item i:	Bits 59-54:	ELTYP, element type being constrained.
	Bits 53-42:	ELSS, subset being constrained.
	Bits 41-35:	Reserved.
	Bits 34-30:	NLT, total number of laminae for element type ELTYP in subset ELSS.
	Bits 29-24:	NLU, number of upper laminae in element type ELTYP in subset ELSS.
	Bits 23-15:	Reserved
	Bits 14-0:	Pointer to variable constraints data block in NVARIAa matrix. A zero indicates that constraint data is not defined for this optimization problem.
Generation:	Program DESINPT of the design proprocessor.	

OPTIMIZATION DATA MATRIX

File: DATARNF

Index Name: NØD001a, NØD002a, ..., NØD999a

Type: NIXED

Dimensions: M*1, M = (NW+1) * NOSM, where NOS = 3000/(NW+1) and NW = (Number of elements in data set + 59)/60. NW is number of words required for a bit position vector representing a data set of elements. NOSM represents the maximum number of data blocks in a partition. The last partition is truncated to include the number of defined data blocks.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	The matrix index name
Words 3-10:	Zero

Elements: Each data block is composed of a one word header and a NW word problem subset vector.

Item 1:

Bits 59-45:	Reserved
Bits 44-30:	NOSEK, number of elements in problem.
Bits 29-15:	MINSEK, miminum internal element number in problem.
Bits 14-0:	MAXSEK, maximum internal element number in problem.

Item 2-(NW+1):

Bits 59-0: The i-th bit of this NW word vector corresponds with the i-th internal element number associated with a particular data set. The bit numbering is left to right starting at 1. Each on bit indicates that the corresponding element is a part of the optimization problem represented by this data block.

Generation: Program DESINPT of the design data proprocessor.

PARAMETER MATRICES

File: DATARNF

Index_Name: NPARAMa

Type: MIXED

Dimensions: M*1, where M = 6+2N and N equals the number of allowed stages (Max. = 10).

Auxiliary_ID:

Word 1:	DATARNF
Word 2:	NPARAMa
Word 3:	Largest stage number defined.
Word 4:	Number of rows in KSF001A
Word 5:	Number of elements in KSF001A
Words 6-10:	Zero

Elements:

Item 1:	Number of Design Data Blocks (number of NPDxxxa partitions) (integer)
Item 2:	Number of Bounds Data Blocks (number of NPBxxxa partitions) (integer)
Item 3:	Number of Margin Data Blocks (number of NMSxxxa partitions) (integer)
Item 4:	Number of Compression Allowable Tables (number of tables in NALLOWC) (integer)
Item 5:	Number of Shear Allowable Tables (number of tables in NALLOWS) (integer)
Item 6:	Number of Stop Sizing Blocks (number of NSTxxxa partitions) (integer)
Item 6+2*i-1:	Number of Design Loads Blocks for Stage i (number of NLxxxba partitions) (integer)
Item 6+2*i:	Number of Thermal Design Loads Blocks for Stage i (number of NTxxxba partitions) (integer)

Generation: Program DESINPT of the design data preprocessor.

BOUND DATA MATRICES

File: DATARNF

Index Name: NPB001a, NPB002a, ..., NPB999a

Type: MIXED

Dimensions: M*1, where $M = 1 + NF + \sum_{i=1}^{NF} NTOTi$

NF is the number of elements in the corresponding partition of the KSF-matrix and NTOT is the number of words required for each block (body) of element bound data. The size of NTOT is dependent on element type.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	The matrix index name
Words 3-10:	Zero

Elements:

Item 1:

Bits 59-30:	Reserved for future use
Bits 29-15:	NF, number of elements contained in this matrix (integer)
Bits 14-0:	NBEG, number (internal) of the first element in this partition (integer)

Item 2-(NF+1):

Bits 59-54:	EC, the element code (integer)
Bits 53-42:	Reserved for future use
Bits 41-39:	NU, the number of words above pointer in data body (integer)
Bits 38-30:	NTOT, total number of words in the data body (integer)
Bits 29-15:	ULABEL, the user element number (integer)

	Bits 14-0:	POINT, pointer to the body of element bound data (integer)
Item NF+2:	Bits 59-54:	NLB, the number of lower bounds on element properties (integer)
	Bits 53-48:	Reserved for future use
	Bits 47-42:	NUB, the number of upper bounds on element properties (integer)
	Bits 41-0:	Reserved for future use.

Item (NF+3)-(NF+NLB+2):

Lower bounds data (real, except for integer zero which indicates no change for that property)

Item (NF+NLB+3)-(NF+NLB+NUB+2):

Upper bounds data (real, except for integer zero which indicates no change for that property)

The block of bounds data are repeated for each element.

Generation: Program DESINPT of the design data preprocessor.

DESIGN DATA MATRICES

File: DATARNF

Index Name: NPD001a, NPD002a, ..., NPD999a

Type: MIXED

Dimensions: M*1, where $M = 1 + NF + \sum_{i=1}^{NF} NTOTi$

NF is the number of elements in the corresponding partition of the KSF-matrix and NTOT is the number of words required for each block (body) of element design data. The size of NTOT is dependent on element type.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	The matrix index name
Words 3-10:	Zero

Elements:

Item 1:

Bits 59-30:	Reserved for future use
Bits 29-15:	NF, number of elements contained in this matrix (integer)
Bits 14-0:	NBEG, number (internal) of the first element in this partition (integer)

Item 2-(NF+1):

Bits 59-54:	EC, the element code number (integer)
Bits 53-42:	Reserved for future use
Bits 41-39:	NU, the number of words above pointer in data body (integer)
Bits 38-30:	NTOT, total number of words in the data body (integer)
Bits 29-15:	ULABEL, the user element number (integer)

	Bits 14-0:	POINT, pointer to the body of element data (integer)
Item NF+2:	Bits 59-54:	DP, the number of design properties (integer)
	Bits 53-48:	DPP, relative pointer to design properties, 0 if no properties (integer)
	Bits 47-42:	FP, the number of fixed properties (integer)
	Bits 41-0:	Reserved for future use
Item NF+3:	Bits 59-51:	M, the material allowables code (integer)
	Bits 50-42:	MC, the compression buckling table code (integer)
	Bits 41-33:	MS, the shear buckling table code (integer)
	Bits 32-21:	Reserved for future use
	Bits 20-9:	MCF, the compression buckling table factor x 1000 (integer)
	Bits 8-0:	Reserved for future use

Item (NF+4)-(NF+DP+3):

Design property data (real, except for integer zero which indicates no change for that property)

Item (NF+DP+4)-(NF+DP+FP+3):

Fixed property data (real, except for integer zero which indicates no change for that property)

The block of design data are repeated for each element.

<u>Generation</u>: Program DESINPT of the design data preprocessor.

SMOOTHING PROPERTY CONTROL MATRIX

File:	DATARNF
Index Name:	NSMCNTa
Type:	MIXED
Dimensions:	M*1 where M is the total number of elements to be smoothed.
Auxiliary ID:	Word 1: DATARNF Word 2: NSMCNTa Words 3-10: Zero
Elements:	Row i contains the following information for the i-th local element to be smoothed.

Bits 59-44:	IELENO, the internal element number of the i-th element.
Bits 42-41:	KO, flag indicating type of property data update to perform on composites: 0 = total replacement, 1 = layer count replacement
Bits 40-36:	NP, the number of property values for element IELENO.
Bits 35-30:	ITYPE, the integer type of element IELENO.
Bits 29-21:	KSFPN, the partition number of the KSF matrix which contains data for IELENO.
Bits 20-15:	NSPPN, the partition number of the NSP matrix which contains property data for smoothing IELENO.

Bits 14-0: IPOINT, pointer to the data block in the NSPPN partition of the NSPxxxx matrix where the property values for smoothing IELENO will be stored.

Generation: Program DESINPT of the design data preprocessor.

SMOOTHING PROBLEM KEY MATRIX

File: DATARNF

Index Name: NSMKEYa

Type: MIXED

Dimensions: M*1, where M is the number of smoothing problems defined by the smoothing data.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	NSMKEYa
Words 3-10:	Zero

Elements: Row i contains the following information for the i-th smoothing problem.

Bits 59-58: KO, this is the smoothing option key. A zero value indicates that the user has specified a set of property values in the input data for smoothing. A 1 value indicates that the property values are to be obtained from internal element IDKE. A 2 value indicates that IDSM must be decoded into a 10 bit subset number and a 6 bit element type. The subset must be scanned for the maximum property values of the specified element type.

Bits 57-42: IDSM, this is the identity of the smoothing problem. If CODE is represented by a zero bit, IDSM identifies the internal element number of an element to be smoothed. If CODE is represented by a 1 bit, IDSM identifies an element type (ITYPE, bits 47-42) within a stiffness element subset (IDS, bits 57-48) to be smoothed.

Bit 41: CODE, this code bit defines the use of the IDSM field. A zero bit indicates that IDSM is an internal element number (IELENO). A 1 bit indicates that IDSM is packed with a subset number (IDS) and an element type (ITYPE). See IDSM for subfield bit ranges.

Bits 40-36: NP, number of property values associated with this problem.

Bits 35-21: IDKE, identity of the element for obtaining property values if the value of KO is 1. Otherwise IDKE is zero.

Bits 20-15: NSPPN, identity of the NSPxxxx partition where the property data for smoothing is to be stored. If KO is zero, the data is stored during input. Otherwise it is stored during execution.

Bits 14-0: IPOINT, pointer to the data block in the NSPPN partition of the NSPxxxx matrix where the property values for smoothing problem i will be stored.

Generation: Program DESINPT of the design data preprocessor.

SMOOTHING PROPERTY DATA MATRIX

File: DATARNF

Index Name: NSP001a, NSP002a, ..., NSP999a

Type: MIXED

Dimensions: M*1 where M $\leq$ 3100

Auxiliary ID:

Word 1:	DATARNF
Word 2:	The matrix name.
Words 3-10:	Zero

Elements: This matrix contains a series of property data blocks that are defined in response to the smoothing data. There is one block reserved for each smoothing problem (row) of the NSMKEYa matrix. The element type associated with the smoothing problem dictates the block size.

Generation: Program DESINPT of the design data proprocessor.

RESTRAIN SIZING MATRIX

File:	DATARNF
Index Name:	NST001a, NST002a, ..., NST999a
Type:	MIXED
Dimensions:	M*1, where M = (NF+59)/60 and NF equals the number of elements in the corresponding KSF matrix partition.
Auxiliary ID:	Word 1: DATARNF Word 2: The matrix index name Word 3: NBEG Words 4-10: Zero
Elements:	Each item contains element sizing data where each bit position, numbered right to left, corresponds to an internal element number. Elements 1 through 60 are represented by row 1, elements 60(i-1) through 60i are represented by row i, etc. The bit code is as follows: 0 = element is to be sized 1 = restrain (stop) element sizing
Generation:	Program DESINPT of the design data preprocessor.

TEMPERATURE DATA MATRICES

File: DATARNF

Index Name: NT001ba, NT002ba, ..., NT999ba

Type: MIXED

Dimensions: M*1, where M ≤ 3100. M=1+NF*(1+4*NTLC), NF is the number of elements in this partition, and NTLC is the number of thermal design loadcases.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	The matrix index name
Words 3-10:	Zero

Elements:

Item 1:

Bits 59-30:	Reserved for future use
Bits 29-15:	NF, number of elements in this matrix (integer)
Bits 14-0:	NBEG, number (internal) of the first element in this partition (integer)

Item 2-(NF+1):

Bits 59-54:	EC, element code number (integer)
Bits 53-42:	NTL, number of defined thermal design loadcases for this element (integer)
Bits 41-30:	Reserved
Bits 29-15:	ULABEL, user element number (integer)
Bits 14-0:	POINT, pointer to the body of element data (integer)

Item (NF+2)-M:

Element data.

Starting with the pointer word there are NTCL sets of 4 words containing thermal design loads information as follows:

Word 1:	Thermal design loadcase number (integer)	
Word 2:	Bits 59-9:	LFS1, load factor for the first case (real)
	Bits 8-0:	LCS1, loadcase number (integer)
Word 3:	Bits 59-9:	LFS2, load factor for the second case (real)
	Bits 8-0:	LCS2, loadcase number (integer)
Word 4:	Element temperature (real)	

<u>Generation</u>: Program DESINPT of the design data preprocessor.

THERMAL DESIGN LOAD CASE MATRIX

File: DATARNF

Index Name: NTLCRba

Type: MIXED

Dimensions: M*3, where M is the maximum number of thermal design load cases (NTLC) plus the maximum number of ingrediant load cases (2*NTLC).

Auxiliary ID:

Word 1:	DATARNF
Word 2:	NTLCRba
Word 3:	ITL, the number of thermal design load cases used.
Word 4:	ITC, the number of thermal design ingrediant load cases used.
Words 5-10:	Zero

Elements: Column 1 contains the following data:

Item 1-ITC: Internal load case number (integer)

Item (ITC+1)-M:

Zero

Column 2 contains the following data:

Item 1-ITC: User label for ingrediant load cases.

Item (ITC+1)-(2*NTCL):

Zero

Item (2*NTLC+1)-(2*NTLC+ITL):

User label for thermal design load cases.

Item (2*NTCL+ITL+1)-M:

Zero

Column 3 contains the following data:

Item 1-(2*NTLC):

Zero

Item (2*NTCL+1)-(2*NTLC+ITL):

Ultimate/limit data, (0=ultimate, 1=limit) for corresponding load case (integer).

Item (2*NTCL+ITL+1)-M:

Zero

Generation: Program DESINPT of the design data preprocessor.

VARIABLE CONSTRAINTS DATA MATRIX

File: DATARNF

Index Name: NVARIAa

Type: MIXED

Dimensions: M*1, where M is equal to the sum of 10 times the number of CPLATE constraint problems plus 20 times the number of CCOVER constraint problems.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	NVARIAa
Words 3-10:	Zero

Elements:

The elements are grouped into data blocks, one block for each constraint problem. The first 10 positions of a block are assigned to the upper layer. If a CCOVER is constrained, a second set of 10 positions are assigned to the lower layer. The indexing is 1 to 10 for a CPLATE and 1 to 20 for a CCOVER.

Within each block the ith relative location is associated with the ith-laminae, and contains the number of the contraint lamina.

The data blocks are accessed using pointers from the NODVCCa matrix.

Generation: Program DESINPT of the design data preprocessor.

RHO3 CASE DATA MATRIX

File:	DATARNF
Index Name:	R30i000
Type:	MIXED
Dimensions:	2008 * 1
Auxiliary ID:	Word 1: DATARNF Word 2: R30i000 Words 3-10: Zero

Elements: The array contains the contents of the RHO3 adjacently stored labeled common blocks:

BASIC	CSGEOM
OPTIONS	TABLE
COUNT	COND
MSGEOM	FILES
	RO3MOD

BASIC contains constants, counter, and key RHO3 options.

COMMON /BASIC/

ZERO	=	Complex zero
PI	=	Value of PI
PI02	=	PI/2
INDCM	=	C=Matrix indicator, B=main surface, N=control surface
SYM	=	Symmetry indicator, 1-symmetric, 2-antisymmetric
SPAN	=	Semispan
BO	=	Root semichord (or some other reference length)
SH	=	Span/BO
KVAL	=	K-value, reduced frequency = BO*OMEGA/V
MACH	=	Mach number
BETA	=	SQRT (1-Mach**2)
KSQD	=	KVAL**2
BETASQD	=	BETA**2

RHO3RNF	=	Name of the RHO3 output random name file. INPREP extracts the name from the ATLAS labeled common block KQRNDM. It is normally equal to 7LRHØ3RNF.
NCASE	=	The data case number for the current RHO3 data case
NCOND	=	The data condition number for the current RHO3 data condition.

OPTIONS contains variables choosing optional paths.

COMMON /OPTIONS/

CMOPT	=	C-Matrix option, .T.=Generate a new C-matrix file .F.=Use/update an old C-matrix file
PRSOPT	=	Pressure report option, .T.=Report unsteady pressure at default or user defined locations .F.=No report
SGFOPT	=	Sectional generalized force option, .T.=Report sectional generalized forces at default or JSER defined chords, .F.=No generalized force calculations
GEXOPT	=	Gust excitation option, .T.=Include a gradual or non-gradual penetration gust mode
VPOPT	=	Velocity profile option, .T.=Modify modal input by user supplied velocity profile = V(LOCAL)/V(INFINITY)
MINPOPT	=	Modal input print option, .T.=Print input points and deflections
MOPOPT	=	Modal output print option, .T.=print interpolated deflection and slope at downwash points
DWPOPT	=	Downwash print option, .T.=Print downwash matrix
PCPOPT	=	Pressure coefficient print option, .T.=Print coefficients of the assumed pressure series

GFFOPT	=	Generalized force print option, -1=Print no generalized forces 0=Print all generalized forces N=Print first N generalized forces
SFSOPT	=	Scratch file save option, .T.=Do not delete scratch files RHOSC1 and RHOSC2 following job completion, .F.=Delete scratch files
ATLASOP	=	ATLAS input option, .T.=MIFILE will be a SNARK I/O sequential file containing modal input point coordinates and deflection .F.=No ATLAS type input
NSPOPT	=	Non-symmetric planform option, .T.=Planform specified has no mirror image, e.g., fin, .F.=Standard mirror image planform
MITOPT	=	Modal input point transformation option, .T.=Do not perform coordinate transformation on input points in surface spline interpolation

COUNT contains variables defining the problem size

COMMON /COUNT/

NDWC	=	Number of downwash chords
NPDWC	=	Number of points per downwash chord
NDWP	=	Number of downwash point=NDWC*NPDWC
NSPT	=	Number spanwise pressure terms
NCPT	=	Number of chordwise pressure terms
NPTRM	=	Number of assumed pressure modes= NSPT*NCPT
NPRC	=	Number of pressure report chords
NPPRC	=	Number of points per pressure report chord
NPPT	=	Number of pressure report points = NPRC*NPPRC
NSGFC	=	Number of sectional generalized force report chords
NDWMDS	=	Number of downwash modes
NWTMDS	=	Number of weighting function modes Note NDWMDS=NWIMDS+1(if GEXOPT.T.)
NOKVAL	=	Number of reduced frequencies

IKVAL	=	Reduced frequency counter
NOMACH	=	Number of structural grid (modal input) points

MSGEOM contains main surface geometry data

COMMON /MSGEOM/

MSID	=	Main surface C-matrix ID
YDWC(9)	=	Downwash chords
XDWP(72)	=	Downwash points
DXLEDWC(9)	=	Slope of leading edge at downwash chord intersect
XGUST	=	Zero phase reference point for a gradual penetration gust mode
YROOT	=	Y value of planform root from user input YLE, used to relocate all Y values about zero
XMDWC(9)	=	Mid-chord of downwash chords
BOWC(9)	=	Semi-chord value of downwash chord
DXTEDWC(9)	=	Slope of trailing edge at downwash chord intersect
NLE	=	Number of leading edge definition points
XLE(10)	=	X-value of leading edge definition points
YLE(10)	=	Y-value of leading edge definition points
DXLEDY(9)	=	Slope of leading edge definition lines
XLEDWC(9)	=	Leading edge of downwash chords
NTE	=	Number of trailing edge definition points
XTE(10)	=	X-value of trailing edge definition points
YTE(10)	=	Y-value of trailing edge definition points
DXTEDY(9)	=	Slope of trailing edge definition lines
XTEDWC(9)	=	Trailing edge of downwash chords

CSGEOM contains surface geometry data

COMMON /CSGEOM/

NOCS	=	Number of control surfaces
CSID(4)	=	Control surface C-matrix ID
CSTYPE(4)	=	Control surface type, 1=full, 2=tip, 3=mid, 4=partial
CSRS(4)	=	Surface to which control surface is related (attached)
HGAP(4)	=	Gap at hinge between main surface and control surface
XHLI(4)	=	X-value inboard hinge definition point
YHLI(4)	=	Y-value inboard hinge definition point
XHLBARI(4)	=	X-bar value of L.E. of inboard C/S side edge
XHLO(4)	=	X-value outboard hinge definition point
YHLO(4)	=	Y-value outboard hinge definition point
XHLBARO(4)	=	X-bar value of L.E. of outboard C/S side edge
DXHLDY(4)	=	Slope of hinge line
XHLDWC (4,9)	=	Hinge intersection of downwash chord
DXHLDWC (4,9)	=	Slope of hinge at downwash chord intersect

TABLE will contain the RHO3 C-matrix index table

COMMON /TABLE/

RTITLE(9)	=	Run title with date appended
TABLE (18,50)	=	CMFILE table of contents
NOMAT	=	Number of C-matrices in CMF1 file of CMFILE
ITHMAT	=	The number of a C-matrix on (or to be put on) CMFILE. When extracting a C-matrix from CMFILE, ITHMAT will be the one to be read. After writing a C-matrix on CMFILE, NOMAT and ITHMAT will be the one to be read. After writing a C-matrix on CMILE, NOMAT and ITHMAT will be equal.

The following variables are stored in TABLE prior to C-matrix generation or use. They will be stored elsewhere or discarded before TABLE is needed for C-matrix indexing.

(TABLE,YPC),	(TABLE(12,1),XPPT),
(TABLE(9,14),PXLE),	(TABLE(2,15),PDSLEDE),
(TABLE(14,180,PDXHLDE),	(TABLE(4,21),PXTE),
(TABLE(15,21),PDXTEDE),	(TABLE(8,22),PB),
(TABLE(1,23),YSGFC),	(TABLE(4,24),XLESGF),
(TABLE(7,25),DXLDESF),	(TABLE(10,26),XMIDSGF),
(TABLE(13,27),XHLSGF),	(TABLE(7,32),DXHLSGF),
(TABLE(1,37),XTESGF),	(TABLE(4,38),DXTDESF),
(TABLE(7,39),BSGF),	(TABLE(10,40),NVPPTS),
(TABLE(11,40),VPFL),	(TABLE(1,42),XVP),
(TABLE(9,43),COFVP),	(TABLE(1,49),DVPFL),

Variables associated with pressure report

YPC	=	Spanwise stations of chords containing pressure report points
XPPT	=	X-coordinates of pressure report points on the chords YPO
PXLE	=	Chord intersect with leading edge
PDXLEDE	=	Slope of leading edge at PXLE
PXMID	=	X-coordinate of chord midpoint
PXHL	=	Chord intersection with control surface hinge line(s) or the constant percent chord extension(s)
PDXHLDE	=	Slope of line intersection chord at PXHL
PXTE	=	Chord intersect with trailing edge
PDXTEDE	=	Slope of trailing edge at PXTE
PB	=	Length of semi-chord

Variables associated with sectional generalized forces

YSGFC	=	Spanwise stations of chords for sectional generalized forces
XLESGF	=	Chord leading edge intersect
DXLDESF	=	Slope of leading edge at XLESGF
XMIDSGF	=	X-coordinate of chord midpoint
XHLSGF	=	Chord intersection with control surface hinge line(s) of the constant percent chord extension(s)

DXHLSGF = Slope of line intersecting chord at XHLSGF
XTESGF = Chord trailing edge intersect
DXTDESF = Slope of trailing edge at XTESGF
BSGF = Length of semi-chord

Variables associated with velocity profile

VPFL = Profile modification
XVP = Percent of chord corresponding 1 to 1 with VPFL
COFVP = Coefficients for cubic spline passing through the input points
DVPFL = Slopes of cubic spline at defining points

COND contains the condition arrays, Mach number and K-values

COMMON /COND/

KVALUE(20) = Array of reduced frequencies
MACHNO(20) = Array of Mach numbers

FILES contains all of the files used by RHO3 in ATLAS

COMMON /FILES/

CMFILE = C-matrix I/O file
CMF1 = First pertinent file on CMFILE
MIFILE = Modal input file
MIF1 = First pertinent file on MIFILE
MIM1 = First pertinent matrix in file MIF1 of MIFILE
GFFILE = Generalized force output file
GFF1 = First pertinent file on GFFILE
GFM1 = First pertinent matrix in file GFF1 of GFFILE
IN = Input file (normally standard input)
OUT = Output file (normally standard output)
RHOSC1 = Scratch file, used as DWSFILE= Downwash scratch file

RHOSC2	=	Scratch file, used as CMSFILE= C-matrix scratch file, COFFILE=Pressure coefficient file
RHOSC3	=	Scratch file, used as IFSFILE= Interpolation function scratch file

RO3MOD contains the variables associated with modal data

COMMON		/RO3MOD/
MSOCOF	=	Name of interpolation coefficient matrix for main surface
CSICOF(4)	=	Name(s) of interpolation coefficient matrices for control surfaces I, I=1, NOCS
MOD1MS	=	The number of the first mode to be used from MSOCOF for the main surface
MOD1CS(4)	=	The number of the first mode to be used from CSICOF for control surface I, I=1 NOCS
NRBM	=	Number of rigid body modes
RBREF(3)	=	Reference point for the NRBM rigid body modes
RBTYPE(6)	=	Type of the NRBM rigid body modes
RBMAG(6)	=	Magnitude of the NRBM rigid body modes
MODECS(4)	=	Array containing one number for each control surface (=0 if no user hinge rotations, otherwise contains name of record on DATARNF containing user rotations)
ENDR3D	=	Last word of a RHO3 data case (i.e., last word of labelled common blocks to be passed from the preprocessor to the RHO3 technical module)
CKSMR3D	=	Word available for storage of array CHECKSUM by Matrix1 Read/Write routines

Generation: Program INRHO3 of the RHO3 preprocessor.

USER INPUT CUBIC HINGE ROTATION MATRICES

File: DATARNF

Index Name: RCmi000

Type: MIXED

Dimensions: 5*NM, where NM equals the number of modes for which cubic hinge rotations were input.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	RCmi000
Words 3-10:	Zero

Elements: The i-th column contains the mode number and cubic hinge rotations for the i-th mode for which the user input hinge rotation coefficients.

Item 1-4: The actual cubic coefficients of hinge rotation

Item 5: The node number

Generation: Program INRHO3 of the RHO3 preprocessor.

ELEMENT SUBSET MATRIX

File:	DATARNF
Index Name:	SEKddda, SEMddda
Type:	MIXED
Dimensions:	M*1 where M = (Number of elements in the data set + 59)/60.
Auxiliary ID:	Word 1: DATARNF Word 2: The matrix index name Word 3: Number of elements in this subset Word 4: Minimum internal element number in this subset Word 5: Maximum internal element number in this subset Words 6-10: Zero
Elements:	The i-th bit of this vector corresponds with the i-th internal element number associated with a particular data set. Bit 1 is the leftmost bit of the first word, bit 60 the rightmost bit of the first word, bit 61 the leftmost bit of the second word, etc. If internal element number "i" is included in the subset, the i-th bit is set to 1. Otherwise, the bit is set to zero.
Generation:	Program SETDEFN of the subset-definition preprocessor.

ORDERED ELEMENT SUBSET MATRIX

File:	DATARNF
Index Name:	SGKddda, SGMddda
Type:	MIXED
Dimensions:	M*1 where M = (number of elements in the ordered subset + 3)/4
Auxiliary ID:	Word 1: DATARNF Word 2: The matrix index name. Words 3-10: Zero
Elements:	The element internal id's are stored 4 per word in the order specified on the subset definition command. (Storage is left to right, word 1 to word M)
Generation:	Program SETDEFN of the subset-definition preprocessor.

NODAL DATA SUBSET MATRIX

File:	DATARNF
Index Name:	SNKddda
Type:	MIXED
Dimensions:	M*1 where M = (number of nodes in the data set + 59)/60.

Auxiliary ID:	Word 1:	DATARNF
	Word 2:	The matrix index name
	Word 3:	Number of nodes in the particular subset
	Word 4:	Minimum internal node number in subset
	Word 5:	Maximum internal node number in subset
	Words 6-10:	Zero

Elements: The i-th bit of this vector corresponds with the i-th internal node number associated with a particular data set. Bit 1 is the leftmost bit of the first word, bit 60 the rightmost bit of the first word, bit 61 the leftmost bit of the second word, etc. If internal node number "i" is included in the subset, the i-th bit is set to 1. Otherwise the bit is set to zero.

Generation: Program SETDEFN of the subset-definition preprocessor.

ORDERED NODAL SUBSET MATRIX

File:	DATARNF
Index Name:	SPKddda
Type:	MIXED
Dimensions:	M*1 where M = (Number of nodes in the ordered subset + 3)/4
Auxiliary ID:	Word 1: DATARNF Word 2: The matrix index name. Words 3-10: Zero
Elements:	The node internal id's are stored 4 per word in the order specified on the subset definition command. (Storage is left to right, word 1 to word M)
Generation:	Program SETDEFN of the subset-definition preprocessor.

SUPERPOSITION DISPLACEMENT CONSTRAINTS

File: DATARNF

Index Name: SUDISba

Type: MIXED

Dimensions: N * 1, where $N = NDISPLC + \sum_{k=1}^{NDISPLC} NUMDFk$

NDISPLC = number of load cases specified in displacement constraints.

NUMDFk = number of degrees of freedom for loadcase k.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	SUDISba
Word 3:	NDISPLC
Words 4-10:	Zero

Elements:

Item 1-NDISPLC:

Bits 59-45:	Loadcase ID
Bits 44-30:	Number of restrained degrees of freedom NUMDF
Bits 29-15:	Reserved
Bits 14-0:	Pointer to data.

Item NDISPLC+1:

Internal node number (integer)

Item NDISPLC+2:

Degree of freedom indicator, 2 characters, left adjusted, with blank fill (alphanumeric)

Item NDISPLC+3:

Value VAL for the constrained degree of freedoms. (real)

The last three items are repeated for each contrained degree of freedom.

Generation: Program SPDATIN of the stress data preprocessor.

SUPERPOSITION LOADCASE LABELS

File:	DATARNF
Index Name:	SULCTba
Type:	MIXED
Dimensions:	11*N where N is the number of user defined superposition load cases.
Auxiliary ID:	Word 1: DATARNF Word 2: SULCTba Words 3-10: Zero
Elements:	Column i contains the user load case data corresponding to local loadcase i. Row 1 contains user labels (integer or alphanumeric). Rows 2 thru 11 contain user defined load case identifiers (alphanumeric).
Generation:	Program SPDATIN of the stress data preprocessor.

SUPERPOSITION STAGE DATA

File: DATARNF

Index Name: SUPERba

Type: MIXED

Dimensions: N*1, where $N = 1 + \sum_{k=1}^{NLC} (1+3*NUMLCk)$

where NLC is the number of loadcases to be created, and NUMLCk is the number of component loadcases for loadcase k.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	SUPERba
Words 3-10:	Zero

Elements:

Item 1:

Bits 59-50:	Represent component stages in this matrix. The stage positions are numbered 1 thru 10 from left to right. On bits indicate stages represented in this supstage.
Bits 49-12:	Reserved.
Bits 11-0:	Total number of load cases to create (NLC)

Item 2-(NLC+1):

Bits 59-39:	Reserved.
Bits 38-27:	Local (internal) loadcase ID.
Bits 26-15:	Number of component loadcases, NUMLC
Bits 14-0:	Pointer to data.

Item NLC+2: Stage number (integer)

Item NLC+4: Load factor (real) or "QX" (alphanumeric), a factor to be calculated.

Items (NLC+2)-(NLC+4) are repeated for each component loadcase of every superposition loadcase.

Generation: Program SPDATIN of the stress data preprocessor.

SUPERPOSITION STAGE TABLE

File:	DATARNF	
Index Name:	SUPSTGa	
Type:	MIXED	
Dimensions:	10 * 2	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	SUPSTGa
	Words 3-10:	Zero

Elements:

Row i is associated with stage i. Column 1 defines the stage type:
0 = no stage defined
1 = standard stage
2 = superposition stage

Column 2 flags the existence of unknown factors in a superposition stage:
0 = none
1 = unknown factors present

Generation: Program SPDATIN of the stress data preprocessor.

SUPERPOSITION STRESS CONSTRAINTS

File: DATARNF

Index Name: SUSTRba

Type: MIXED

Dimensions: $N * 1$, where $N = NSTRSLC + \sum_{k=1}^{NSTRSLC} NUMSTRk$

NSTRSLC = number of loadcases specified for stress constraints.

NUMSTRk = number of constrained stresses for load case k.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	SUSTRba
Word 3:	NSTRSLC
Words 4-10:	Zero

Elements:

Item 1-NSTRSLC:

Bits 59-45:	Loadcase ID
Bits 44-30:	Number of restrained stresses (NUMSTRAk)
Bits 29-15:	Reserved.
Bits 14-0:	Pointer to data.

Item NSTRSLC+1:

Internal element number (integer)

Item NSTRSLC+2:

The "local" order of the requested stress as shown in the element key matrix (integer)

Item NSTRSLC+3:

Value of constrained stress (real)

The last three items are repeated for each constrained stress.

<u>Generation</u>: Program SPDATIN of the stress data preprocessor.

FLUTTER DATA MATRIX

File:	DATARNF
Index Name:	ULCSi
Type:	MIXED
Dimensions:	NTOT*1 where:

$$NTOT = 14+NALT+NGD+\sum_{i=1}^{NRS} (1+NELi) + \sum_{i=1}^{NCHS} \{NWTCSi\}$$

NALT = number of altitudes
NGD = number of generalized damping
NRS = number of retention vector sets
NELi = number of elements in the ith retention vector set.
NCHS = number of change sets for this case.
NWTCSi = number of words in the ith change set data.

Auxiliary ID:

Word 1: DATARNF
Word 2: ULCSi
Words 3-10: Zero

Elements: This matrix contains the nominal case data and the changeset data. The nominal case data consists of a user defined title, arrays of input altitudes, and diagonal elements of the generalized structural damping and retention vector sets. (degrees of freedom) The changeset case data includes a user defined title, change matrix instructions for the generalized mass, stiffness and damping matrices, selection of retention vectors sets, eigensolution vectors, and redefinition of altitudes.

Item 1:	Bits 59-30:	Number of altitudes (NALT)
	Bits 29-0:	Pointer to the altitude data (N1)
Item 2:	Bits 59-30:	Number of modes for damping (NGD)
	Bits 29-0:	Pointer to the damping data (N2)

Item 3:	Bits 59-30:	Number of retention vectors sets (NRS)
	Bits 29-0:	Pointer to the first retention vector set data (N3)
Item 4:	Bits 59-30:	Number of changesets (NCHS)
	Bits 29-0:	Pointer to the first changeset data (N4)
Item 5-6:	Reserved	
Item 7-14:	8 word case title	
Item N1-(N1+NALT-1):		
	Altitude data	
Item N2-(N2+NGD-1):		
	Damping data	
Item N3:	Bits 59-30:	Retention vector set identifier (IDRSI)
	Bits 29-0:	Number of elements in 1st retention vector set (NEL1)
Item (N3+1)-(N3+NEL1):		
	Bits 59-30:	Degree of freedom number.
	Bits 29-0:	Degree of freedom number.
Item (N3+NEL1+1):		
	Bits 59-30:	Retention vector set identifier
	Bits 29-0:	Number of elements in 2nd retention vector set (NEL2)
Item N4:	Changeset Number.	
Item N4+1:	Bits 59-30:	Number of words in the changeset instruction for generalized mass (NWMCS)

	Bits 29-0:	Pointer to the mass changeset data. (NMCS).
Item N4+2:	Bits 59-30:	Number of words in the changeset instructions for stiffness matrix (NWSCS).
	Bits 29-0:	Pointer to the stiffness changeset data. (NSCS)
Item N4+3:	Bits 59-30:	Number of words in the changeset instructions for damping matrix (NWDCS)
	Bits 29-0:	Pointer to the damping changeset data (NDCS).
Item N4+4:	Bits 59-30:	Number of words in the retention vector set selection data (NWRCS)
	Bits 29-0:	Pointer to the retention vector selection data (NRCS)
Item N4+5:	Bits 59-30:	Number of words in the normal eigenvector request data (NWECS).
	Bits 29-0:	Pointer to the normal eigenvector request data. (NECS)
Item N4+6:	Bits 59-30:	Number of words in the adjoint eigenvector request data. (NWACS)
	Bits 29-0:	Pointer to the adjoint eigenvector request data. (NAECS)
Item N4+7:	Bits 59-30:	Number of words in the altitude changeset data. (NWALCS)
	Bits 29-0:	Pointer to the altitude changeset data. (NACS)
Item N4+8:	Bits 59-30:	Number of words in the eigenvalue request data. (NWEVCS)
	Bits 29-0:	Pointer to the eigenvalue request data. (NEACS)

Item N4+9: Pointer to 1st word of next changeset data. (NSTCS)

Item (N4+9)-(N4+17):

8 word changeset title.

Item NMCS-(NMCS+NWMCS-1):

Mass changeset data.

Item NSCS-(NSCS+NWSCS-1):

Stiffness changeset data.

Item NDCS-(NDCS+NWDCS-1):

Damping changeset data.

Item NRCS-(NRCS+NWRCS-1):

Retention set selection data.

Item NEACS-(NEACS+NWEVCS-1):

Eigenvalue request data.

Item NEVCS-(NEVCS+NWECS-1):

Normal vector request data.

Item NAECS-(NAECS+NWACS-1):

Adjoint vector request data.

Item NACS-(NACS+NWALCS-1):

Altitude redefinition data.

Item NXTCS: Changeset identifier (IDCS2)

Generation: Program FLPREP of the flutter data preprocessor.

HISTORY PARAMETER MATRIX

File: DESIRNF

Index Name: DESPARa

Type: MIXED

Dimensions: M*4 where M is the number of elements in the history minimum margin of safety matrix.

Auxiliary ID:

Word 1:	DESIRNF
Word 2:	DESPARa
Word 3:	Number of elements
Words 4-10:	Zero

Elements: Row i contains the following data for the i-th element:

Item 1: Internal number of the element in the corresponding row of the history minimum margin of safety matrix

Item 2: Element type

Item 3: Number of entries per cycle

Item 4: Partition number of the minimum margins of safety matrix from which the data contained in the history minimum margins of safety matrix are obtained

Generation: Program HISTORY of the design processor.

HISTORY MINIMUM MARGIN OF SAFETY MATRIX

File:	DESIRNF	
Index Name:	HISTRYa	
Type:	MIXED	
Dimensions:	M*N where M equals the number of elements for which histories were requested and N equals the number of cycles for which histories were requested.	
Auxiliary ID:	Word 1:	DESIRNF
	Word 2:	HISTRYa
	Word 3:	Number of elements
	Words 4-10:	Zero
Elements:	Row i contains the history data for the i-th element requested.	
Item 1:	Minimum margin of safety for the i-th element for the first cycle	
Item K:	Minimum margin of safety for the i-th element for the K-th cycle	
Generation:	Program HISTORY of the design processor.	

STRENGTH MINIMUM MARGINS OF SAFETY MATRIX

File:	DESIRNF	
Index Name:	M001cba, M002cba, ..., M999cba	
Type:	REAL	
Dimensions:	M*1 where M is defined such that each partition contains the same elements as the corresponding KSF matrix partition.	
Auxiliary ID:	Word 1:	DESIRNF
	Word 2:	The matrix index name
	Word 3:	Internal element number of the first element in the partition (NFIRS)
	Word 4:	Internal element number of the last element in the partition (NLAST)
	Words 5-10:	Zero
Elements:	The minimum margins of safety for each element in the partition are stored sequentially beginning with element NFIRS.	
Item i-k:	The minimum margins of safety for element j (k-i+1 words)	
Generation:	Program STRNGTH of the design processor.	

RESIZE MINIMUM MARGIN OF SAFETY MATRIX

File:	DESIRNF
Index Name:	MIN01ca, MIN02ca, ..., MIN99ca
Type:	REAL
Dimensions:	M*1 where M is defined such that each partition contains the same elements as the corresponding KSF matrix partition.
Auxiliary ID:	Word 1: DESIRNF Word 2: The matrix index name Word 3: Internal element number of first element in partition (NFIRS) Word 4: Internal element number of last element in partition (NLAST) Words 5-10: Zero
Elements:	The minimum margins of safety for all resize stages for each element in the partition are stored sequentially beginning with element NFIRS.
Item i-K:	The minimum margin of safety for element j (K-i+1 words)
Generation:	Program HISTORY of the design processor.

STRENGTH PARAMETER MATRIX FOR OUTPUT MARGINS OF SAFETY

File:	DESIRNF	
Index Name:	MPARcba	
Type:	MIXED	
Dimensions:	M*1 where M is the total number of elements in the data set.	
Auxiliary ID:	Word 1:	DESIRNF
	Word 2:	MPARcba
	Word 3:	Total number of elements
	Word 4:	Number of partitions for the margin of safety data
	Words 5-10:	Zero
Elements:	A typical entry j in the matrix contains the following data for the j-th element.	
Item j:	Bits 59-30:	Partition number of the strength margins of safety matrix in which the margins of safety for this element are stored
	Bits 29-0:	Pointer to the first margin of safety for this element
Generation:	Program HISTORY of the design processor.	

POINTER MATRIX FOR MINIMUM MARGINS OF SAFETY

File:	DESIRNF
Index Name:	MP0001a, MP0002a, ..., MP0999a
Type:	MIXED
Dimensions:	M*1 where M is defined such that each partition contains the same elements as the corresponding minimum margins of safety matrix partition.
Auxiliary ID:	Word 1: DESIRNF Word 2: The matrix index name Word 3: Internal element number of the first element NFIRS Word 4: Internal element number of the last element NLAST Words 5-10: Zero
Element:	The i-th item of this matrix contains the pointer to the beginning of the minimum margin of safety data for element NFIRS+i-1.
Generation:	Program HISTORY of the design processor.

THERMAL DESIGN PARAMETER MATRIX FOR OUTPUT MARGINS OF SAFETY

File:	DESIRNF	
Index Name:	MTARcba	
Type:	MIXED	
Dimensions:	M*1 where M is the total number of elements in the data set.	
Auxiliary ID:	Word 1:	DESIRNF
	Word 2:	MTARcba
	Word 3:	Total number of elements
	Word 4:	Number of partitions for the margin of safety data.
	Words 5-10:	Zero
Elements:	A typical entry j in the matrix contains the following data for the j-th element.	
Item j:	Bits 59-30:	Partition number of the thermal design margins of safety matrix in which the margins of safety for this element are stored.
	Bits 29-0:	Pointer to the first margin of safety for this element.
Generation:	Program THERMLX of the design processor.	

THERMAL DESIGN MINIMUM MARGINS OF SAFETY MATRIX

File:	DESIRNF
Index Name:	N001cba, N002cba, ..., N999cba
Type:	REAL
Dimensions:	M*1 where M is defined such that each partition contains the same elements as the corresponding KSF matrix partition.
Auxiliary ID:	Word 1: DESIRNF Word 2: The matrix index name Word 3: Internal element number of the first element in the partition (NFIRS) Word 4: Internal element number of the last element in the partition (NLAST) Words 5-10: Zero
Elements:	The minimum margins of safety for each element in the partition are stored sequentially beginning with element NFIRS.
Item i-k:	The minimum margins of safety for element j (k-i+1 words)
Generation:	Program THERMLX of the design processor.

STRENGTH MARGIN OF SAFETY MATRIX

File:	DESIRNF
Index Name:	S001cba, S001cba, ..., S999cba
Type:	REAL
Dimensions:	M*1 where M is not greater than 3000. Initially 3000 words are reserved for each partition. When there is not enough room for the next element, or there are no more elements, its dimension is reduced to the actual number of words used.
Auxiliary ID:	Word 1: DESIRNF Word 2: The matrix index name Word 3: Internal element number of the first element in the partition (NFIRS) Word 4: Internal element number of the last element in the partition (NLAST) Words 5-10: Zero
Elements:	Associated with each element are k margins of safety calculated for l loadcases. The margins of safety for each element (k*l words) are stored as follows: Element i, loadcase 1 (k words) Element i, loadcase 2 (k words) Element i, loadcase l (k words)
Generation:	Program HISTORY of the design processor.

STRENGTH MARGINS OF SAFETY MATRIX

File: DESIRNF

Index Name: SMIMcba

Type: MIXED

Dimensions: 198xM where M is the number of design load cases plus the number of superposition load cases ($18 \leq M \leq 25$).

Auxiliary ID:

Word 1:	DESIRNF
Word 2:	SMIMcba
Words 3-10:	Zero

Elements: Column j contains the data for internal load case number j.

Item i: The internal element number of the maximum margin of safety for this element property.

Item i+1: The user element number for the maximum margin of safety for this element property.

Item i+2: The maximum margin of safety for this element property.

Item i+3: The internal element number of the minimum margin of safety for this element property.

Item i+4: The user element number for the minimum margin of safety for this element property.

Item i+5: The minimum margin of safety for this element property.

A block of the above data is reserved for each element property margins of safety. The elements are in element type number order and the properties are in order within each element group.

If the element type is not included in this cycle, stage, and set then rows i thru i+5 are zero filled.

<u>Generation</u>: Program HISTORY of the design processor.

THERMAL DESIGN MARGIN OF SAFETY MATRIX

File: DESIRNF

Index Name: T001cba, T001cba, ..., T999cba

Type: REAL

Dimensions: M*1 where M is not greater than 3000. Initially 3000 words are reserved for each partition. When there is not enough room for the next element, or there are no more elements, its dimension is reduced to the actual number of words used.

Auxiliary ID:

Word 1:	DESIRNF
Word 2:	The matrix index name
Word 3:	Internal element number of the first element in the partition (NFIRS)
Word 4:	Internal element number of the last element in the partition (NLAST)
Words 5-10:	Zero

Elements: Associated with each element are k margins of safety calculated for m loadcases. The margins of safety for each element (K*m words) are stored as follows:

Element i, loadcase 1 (k words)

Element i, loadcase 2 (k words)

Element i, loadcase m (k words)

Generation: Program THERMLX of the design processor.

THERMAL MIN.-MAX. MARGINS OF SAFETY MATRIX

File:	DESIRNF
Index Name:	TMIMcba
Type:	MIXED
Dimensions:	198*M where M is the number of design load cases plus the number of superposition load cases ($1 \le M \le 25$).
Auxiliary ID:	Word 1: DESIRNF Word 2: TMIMcba Words 3-10: Zero
Elements:	Column j contains the data for internal load case j.
Item i:	The internal element number of the maximum margin of safety for this element property.
Item i+1:	The user element number for the maximum margin of safety for this element property.
Item i+2:	The maximum margin of safety for this element property.
Item i+3:	The internal element number of the minimum margin of safety for this element property.
Item i+4:	The user element number for the minimum margin of safety for this element property.
Item i+5:	The minimum margin of safety for this element property.

A block of the above data is reserved for each element property margins of safety. The elements are in element type number order and the properties are in order within each element group.

If the element type is not included in this cycle, stage, and set then rows i thru i+5 are zero filled.

Generation: Program HISTORY of the design processor.

DUBLAT CONTROL MATRIX

File: DUBLRNF

Index Name: ACMij00

Type: MIXED

Dimensions: (NUMMN + NUMKV + 59)*1 (110 maximum)

Where:

NUMMN = Number of Mach numbers input
NUMKV = Number of reduced frequency values input

Auxiliary ID:

Word 1:	DUBLRNF
Word 2:	ACMij00
Words 3-10:	Zero

Elements:

Item 1:	NUMEP	EPPTR
Item 2:	NUMKV	KVPTR
Item 3:	NUMMN	MNPTR
Item 4:	NUMNS	NSPTR
Item 5:	NUMMS	MSPTR
Item 6:	NUMGD	GDPTR
Item GDPTR:	GD (real array)	
Item MSPTR:	MS (integer array)	
Item NSPTR:	NS (integer array)	
Item MNPTR:	MN (real array)	
Item KVPTR:	KV (real array)	
Item EPPTR:	EP (mixed array)	

Items 1–6: 2 packed 30 bit integers per word

Where:

NUMEP	=	Number of execution parameters
NUMKV	=	Number of K-values (reduced frequencies
NUMMN	=	Number of Mach numbers
NUMNS	=	Number of problem size parameters
NUMMS	=	Number of matrix sizes
NUMGD	=	Number of gust data parameters
EPPTR	=	Pointer to the first execution parameter EP(1)
KVPTR	=	Pointer to the first K-value, KV(1)
MNPTR	=	Pointer to the first Mach number, MN(1)
NSPTR	=	Pointer to the first problem size parameter, NS(1)
MSPTR	=	Pointer to the first matrix size MS(1)
GDPTR	=	Pointer to the first gust data parameter GD(1)
GD(1)	=	Gust reference plane dihedral
GD(2)	=	Gust reference point
GD(3)	=	Aircraft velocity
GD(4)	=	Gust vertical velocity
NS(1)	=	Number of vibration modes
NS(2)	=	Number of Mach numbers
NS(3)	=	Number of reduced frequency values
NS(4)	=	Number of lifting bodies
NS(5)	=	Number of bodies with doublets
NS(6)	=	Number of body doublet divisions
NS(7)	=	Number of body interference panels
NS(8)	=	Number of lifting panels
NS(9)	=	Number of strips on the body panels
NS(10)	=	Number of strips on the lifting panels
NS(11)	=	Number of boxes on the body panels
NS(12)	=	Number of boxes on the lifting panels
MS(1)	=	Length of the DLCSi matrix
MS(2)	=	Length of the DLPGi matrix
MS(3)	=	Length of the DLBGi matrix
MS(4)	=	Length of the DLDIi matrix
MS(5)	=	Length of the DLVIi matrix

MS(6)	=	Zero
MS(7)	=	Length of DLPIi matrix
MS(8)	=	Length of the DLMCi matrix
MS(9)	=	Length of the DLSSi matrix
MS(10)	=	Length of the B1Cij matrix
MS(11)	=	Length of the B2Cij matrix
MS(12)	=	Length of the SGCij matrix
MS(13)	=	Length of the SBCij matrix
MS(14)	=	Zero
MS(15)	=	Length of the DBCij matrix
MS(16)	=	Length of the VPCij matrix
MS(17)	=	Length of the PSCij matrix
MS(18)	=	Length of the DLRBi matrix
MS(19)	=	Length of the ACMij matrix
MS(20)	=	Length of the DFOijkl matrix
MS(21)	=	Length of the SFOijkl matrix
MS(22)	=	Length of the SDOijkl matrix
MS(23)	=	Length of the PDOijkl matrix
MS(24)	=	Length of the M1Cij matrix
MS(25)	=	Length of the M3Oij matrix
MS(26)	=	Length of the Qzzxxkl matrix
MS(27)	=	Length of the SFBijkl matrix
MS(28)	=	Zero
MS(29)	=	Length of the modal coefficient matrix
KV	=	Array of reduced frequencies
MN	=	Array of Mach numbers
EP(1)	=	Reference semi-chord, BREF
EP(2)	=	Reference semi-span, SREF
EP(3)	=	Reference area, AREF
EP(4)	=	Case number, NCASE
EP(5)	=	Condition number, NCOND
EP(6)	=	Symmetry option for y=0 plane
EP(7)	=	Symmetry option for z=0 plane
EP(8)	=	Quasi-inverse label
EP(9)	=	Yaw/pitch option
EP(10)	=	Check print option
EP(11)	=	AIC option
EP(12)	=	Quasi-inverse option

<u>Generation</u>: Program INPUTG of the doublet-lattice processor

DUBLAT BOX GEOMETRY MATRIX (PART I)

File: DUBLRNF

Index Name: B1Cij00

Type: MIXED

Dimensions: (7*(NUMBPP + NUMBBP + 1))*1

Where:

NUMBPP = Number of boxes on the lifting panels
NUMBBP = Number of boxes on the body interference panels

Auxiliary ID:

Word 1:	DUBLRNF
Word 2:	B1Cij00
Words 3-10:	Zero

Elements:

Item 1:	NUMXS	XSPTR
Item 2:	NUMZS	ZSPTR
Item 3:	NUMXR	XRPTR
Item 4:	NUMYR	YRPTR
Item 5:	NUMDX	DXPTR
Item 6:	NUMDY	DYPTR
Item 7:	NUMGB	GBPTR
Item GBPTR:	GB (real array)	
Item DYPTR:	DY (real array)	
Item DXPTR:	DX (real array)	
Item YRPTR:	YR (real array)	
Item XRPTR:	XR (real array)	
Item ZSPTR:	ZS (real array)	
Item XSPTR:	XS (real array)	

2 packed 30 bit integers per word

Where:

NUMSX	=	Number of box sending point X coordinates
NUMZS	=	Number of box sending point Z coordinates
NUMXR	=	Number of box receiving point X coordinates
NUMYR	=	Number of box receiving point Y coordinates
NUMDX	=	Number of box X lengths
NUMDY	=	Number of box Y lengths
NUMGB	=	Number of box dihedrals (in radians)
XSPTR	=	Pointer to the first box sending point X coordinate, XS(1)
ZSPTR	=	Pointer to the first box sending point Z coordinate, ZS(1)
XRPTR	=	Pointer to the first box receiving point X coordinate, XR(1)
YRPTR	=	Pointer to the first box receiving point Y coordinate, YR(1)
DXPTR	=	Pointer to the first box X length, DX(1)
DYPTR	=	Pointer to the first box Y length, DY(1)
GBPTR	=	Pointer to the first box dihedral, GB(1)

Generation: Program INPUTG of the doublet-lattice processor

DUBLAT BOX GEOMETRY MATRIX (PART II)

File: DUBLRNF

Index Name: B2Cij00

Type: MIXED

Dimensions: (6*(NUMBPP + NUMBBP + 1)*1

Where:

NUMBPP = Number of boxes on the lifting panels
NUMBBP = Number of boxes on the body interference panels

Auxiliary ID:
Word 1: DUBLRNF
Word 2: B2Cij00
Words 3-10: Zero

Elements:

Item			
Item 1:	NUMXI	XIPTR	2 packed 30 bit integers per word
Item 2:	NUMYI	YIPTR	
Item 3:	NUMZI	ZIPTR	
Item 4:	NUMXO	XOPTR	
Item 5:	NUMYO	YOPTR	
Item 6:	NUMZO	ZOPTR	
Item ZOPTR:	ZO (real array)		
Item YOPTR:	YO (real array)		
Item XOPTR:	XO (real array)		
Item ZIPTR:	ZI (real array)		
Item YIPTR:	YI (real array)		
Item XIPTR:	XI (real array)		

Where:

NUMXI	=	Number of box inboard sending point X coordinates
NUMYI	=	Number of box inboard sending point Y coordinates
NUMZI	=	Number of box inboard sending point Z coordinates
NUMXO	=	Number of box outboard sending point X coordinates
NUMYO	=	Number of box outboard sending point Y coordinates
NUMZO	=	Number of box outboard sending point Z coordinates
XIPTR	=	Pointer to the first inboard sending point X coordinate, XI(1)
YIPTR	=	Pointer to the first inboard sending point Y coordinate, YI(1)
ZIPTR	=	Pointer to the first inboard sending point Z coordinate, ZI(1)
XOPTR	=	Pointer to the first outboard sending point X coordinate, XO(1)
YOPTR	=	Pointer to the first outboard sending point Y coordinate, YO(1)
XOPTR	=	Pointer to the first outboard sending point Z coordinate, ZO(1)

<u>Generation</u>: Program INPUTG of the doublet-lattice processor

DUBLAT BODY DOUBLET MATRIX

File: DUBLRNF

Index Name: DBCij00

Type: MIXED

Dimensions: (9*(NUMDBL + NUMBEL)*1

Where:

NUMDBL = Number of bodies with doublets
NUMBEL = Number of body doublet divisions

Auxiliary ID:

Word 1: DUBLRNF
Word 2: DBCij00
Words 3-10: Zero

Elements:

Item 1:	B1	B2PTR	2 packed 30 bit integers
Item 2:	BYDOPT		
Item 3:	BXDOPT		
Item 4:	NUMXC	XCPTR	2 packed 30 bit integers per word
Item 5:	NUMYC	YCPTR	
Item 6:	NUMZC	ZCPTR	
Item 7:	NUMDX	DXPTR	
Item 8:	NUMRO	ROPTR	
Item 9:	NUMRP	RPPTR	
Item RPPTR:	RP (real array)		
Item ROPTR:	RO (real array)		
Item DXPTR:	DX (real array)		
Item ZCPTR:	ZC (real array)		
Item YCPTR:	YC (real array)		

Item XCPTR:	XC (real array)	
Item B2PTR:	B2	B3PTR

The above format is repeated for each body with doublets.

Where:

B1	=	First doublet body ID
B2PTR	=	Pointer to the second doublet body ID (B2PTR=0 if B1 is the last doublet body ID)
BYDOPT	=	Body y-doublet option (1=ON)
BZDOPT	=	Body z-doublet option (1=ON)
NUMXC	=	Number of doublet axes X coordinates
NUMYC	=	Number of doublet axes Y coordinates
NUMDX	=	Number of doublet axes divisions
NUMRO	=	Number of doublet axes radii
NUMRP	=	Number of doublet axes derivatives
XCPTR	=	Pointer to the first doublet axes X coordinate, XC(1)
YCPTR	=	Pointer to the first doublet axes Y coordinate, YC(1)
ZCPTR	=	Pointer to the first doublet axes Z coordinate, ZC(1)
DXPTR	=	Pointer to the first doublet axes division, ZC(1)
ROPTR	=	Pointer to the first doublet axes radii, RO(1)
RPPTR	=	Pointer to the first doublet axes radii derivative, RP(1)

<u>Generation</u>: Program INPUTG of the doublet-lattice processor

DUBLAT GENERALIZED FORCES MATRIX

File:	DUBLRNF
Index_Name:	GF0ijkl
Type:	REAL
Dimensions:	2*NUMMOD where NUMMOD = Number of vibration modes.
Auxiliary_ID:	Word 1: DUBLRNF Word 2: GF0ijkl Word 3: KVAL (reduced frequency value) Word 4: BREF (reference semi-chord) Word 5: MACH (Mach number) Word 6: SREF (reference semi-span) Words 7-10: Zero
Elements:	The elements of the complex array: GFO(NUMMOD, NUMMOD) where: GFO(i,j) = work done by the i-th deflection mode and j-th pressure mode.
Generation:	Program MODFIN of the doublet-lattice processor.

DUBLAT 1/4 CHORD DISPLACEMENT MATRIX

File: DUBLRNF

Index Name: M1Øij00

Type: REAL

Dimensions: (NUMBOX + NUMBEL)*NUMMOD

Where:

NUMBOX = Number of aerodynamic boxes
NUMBEL = Number of body doublet divisions
NUMMOD = Number of vibration modes

Auxiliary ID:

Word 1: DUBLRNF
Word 2: M1Øij00
Words 3-10: Zero

Elements: The elements of the real array:

M10(NUMBOX + NUMBEL, NUMMOD)

Where:

M10(I,J) = 1/4 chord displacements for the I-th box (1≤I≤NUMBOX) or the (I-NUMBOX)th doublet division (1≤I-NUMBOX≤NUMBEL) and the J-th vibration mode.

Generation: Program MODEB of the doublet-lattice processor.

DUBLAT 3/4 CHORD DISPLACEMENTS AND SLOPES

File: DUBLRNF

Index Name: M3Øij00

Type: REAL

Dimensions: (2*(NUMBPP + NUMBBP))*NUMMOD

Where:

NUMBPP = Number of boxes for the lifting panels
NUMBBP = Number of boxes on the body interference
NUMMOD = Number of vibration modes

Auxiliary ID:

Word 1: DUBLRNF
Word 2: M3Øij00
Words 3-10: Zero

Elements: The elements of the complex array:
M30(NUMBPP + NUMBBP, NUMMOD)

Where:

IMAG (M30(I,J)) = 3/4 chord displacement of the I-th box and J-th vibration mode

REAL (M30(I,J)) = 3/4 chord slope of the I-th box and J-th vibration mode

Generation: Program MODEW of the doublet-lattice processor.

DUBLAT PRESSURE DIFFERENCE MATRIX

File: DUBLRNF

Index Name: PDØijkl

Type: REAL

Dimensions: ((2*(NUMBOX + NUMBEL))*NUMMOD)*1

Where:

NUMBOX = Number of aerodynamic boxes
NUMBEL = Number of body doublet divisions
NUMMOD = Number of vibration modes

Auxiliary ID:

Word 1:	DUBLRNF
Word 2:	PDØijkl
Word 3:	KVAL (reduced frequency value)
Word 4:	BREF (reference semi-chord)
Word 5:	MACH (Mach number)
Word 6:	SREF (reference semi-span)
Words 7-10:	Zero

Elements: The elements of the complex array:
PDO(NUMBOX + NUMBEL, NUMMOD)

Where:

PDO(I,J) = Pressure difference for the I-th box (1≤I≤NUMBOX) or the (I-NUMBOX)th doublet division (1≤I-NUMBOX≤NUMBEL) and the J-th vibration mode.

Generation: Program MODFIN of the doublet-lattice processor.

DUBLAT PRESSURE SCALING MATRIX

File: DUBLRNF

Index Name: PSCij00

Type: MIXED

Dimensions: (2+2*(NUMBPP+NUMBBP)+(NUMBPP+NUMBBP+1/60)*1

Where:

NUMBPP = Number of boxes on the lifting panels
NUMBBP = Number of boxes on the body interference panels

Auxiliary ID:

Word 1:	DUBLRNF
Word 2:	PSCij00
Words 3-10:	Zero

Elements:

Item 1:	NUMPS	PSPTR
Item 2:	NUMSW	SWPTR
Item SWPTR:	SW (packed integer array)	
Item PSPTR:	PS (complex array)	

Where:

NUMPS = Number of pressure scale factors (or pressures
NUMSW = Number of pressure scale/replacement switch words = [(Number of boxes-1)/60]+1
PSPTR = Pointer to the first pressure scale factor, PS(1)
SWPTR = Pointer to the first pressure scale/replacement switch word, SW(1)

SW	=	An array of 60-bit words with the i-th bit set to: 1 if the pressure for the i-th box is to be replaced by PS(i) 0 if the pressure for the i-th box is to be scaled by PS(i)
PS	=	A complex array of pressure scale factors and pressure replacement values

<u>Generation</u>: Program INPUTG of the doublet-lattice processor

DUBLAT QUASI-INVERSE MATRIX (0-PARTITION)

File:	DUBLRNF	
Index Name:	Q00xxkl	
Type:	MIXED	
Dimensions:	441*1	
Auxiliary ID:	Word 1:	DUBLRNF
	Word 2:	Q00xxkl
	Word 3:	Zero
	Word 4:	BREF (reference semi-chord)
	Words 5-10:	Zero

Elements:

Item 1:	NUMMNO	=	Number of elements in the MNO array of Mach numbers
Item 2-21:	NUMKVO(k)	=	Number of elements in the KVO array of reduced frequency values for each Mach number
Item 22-41:	MNO(k)	=	Array of Mach numbers for which quasi-inverse matrices have been generated with the label xx defined above
Item 42-441:	KVO(k,1)	=	Array of reduced frequencies for each Mach number for which quasi-inverse matrices have been generated with the label xx defined above

Generation: Program DUBLAT of the doublet-lattice processor.

DUBLAT QUASI-INVERSE MATRIX (LOWER/UPPER PARTITIONS)

File: DUBLRNF

Index Name: Qzzxxkl

Type: MIXED

Dimensions: Minimum of: (2*(NUMBBP+NUMBPP)**2)*1 or (length of blank common)*1

Where:

NUMBBP = Number of boxes on the body interference panels
NUMBPP = Number of boxes on the lifting surfaces

Auxiliary ID:

Word 1:	DUBLRNF
Word 2:	Qzzxxkl
Word 3:	KVAL (reduced frequency value)
Word 4:	BREF (reference semi-chord)
Word 5:	MACH (Mach number)
Word 6:	SREF (reference semi-span)
Words 7-10:	Zero

Elements: The elements of a complex array of the form:

Item 1: NUMELM = Number of elements which follow this word

Item 3-(NUMELM*2+2):
Complex elements of a row of the upper or lower triangular quasi-inverse matrix

Generation: Program QUASII of the doublet-lattice processor

DUBLAT STRIP/BOX CORRESPONDENCE TABLE MATRIX

File: DUBLRNF

Index Name: SBCij00

Type: MIXED

Dimensions: (3+NUMBPP+NUMBBP+NUMBI+NUMPI)*1

Where:

NUMBPP = Number of boxes on the lifting panels
NUMBBP = Number of boxes on the body interference panels
NUMBI = Number of body names for bodies with interference panels
NUMPI = Number of lifting surface names

Auxiliary ID:

Word 1: DUBLRNF
Word 2: SBCijC0
Words 3-10: Zero

Elements:

Item			
Item 1:	NUMPI	PIPTR	2 packed 30 bit integers per word
Item 2:	NUMBI	BIPTR	
Item 3:	NUMPW	PWPTR	
Item PWPTR:	PW (packed integer array)		
Item BIPTR:	BI (integer array)		
Item PIPTR:	PI (integer array)		

Where:

NUMPI = Number of panel IDs
NUMBI = Number of body IDs
NUMPW = Number of packed words in the strip/box correspondence table

PIPTR = Pointer to the first panel ID, PI(1)
BIPTR = Pointer to the first body ID, BI(1)

PWPTR =	Pointer to the first packed word, PW(1)	
PW =	Array of packed words of the form:	
	Bits 59-54:	Zero
	Bits 53-45:	Body index number
	Bits 44-36:	Panel index number
	Bits 35-27:	Box number on strip
	Bits 26-18:	Strip number
	Bits 17-9:	Box number
	Bits 8-0:	Vertical/Horizontal flag (1=Vertical, 0=Horizontal)

Generation: Program INPUTG of the doublet-lattice processor

DUBLAT STABILITY DERIVATIVES MATRIX

File: DUBLRNF

Index Name: SDØijkl

Type: REAL

Dimensions: 10*NUMMOD

Where:

NUMMOD = Number of vibration modes

Auxiliary ID:

Word 1:	DUBLRNF
Word 2:	SDØijkl
Word 3:	KVAL (reduced frequency value)
Word 4:	BREF (reference semi-chord)
Word 5:	MACH (Mach number)
Word 6:	SREF (reference semi-span)
Words 7-10:	Zero

Elements: The elements of the complex array SDO(5,NUMMOD)

Where:

SDO(1,J) = Force coefficient in z direction for J-th vibration mode

SDO(2,J) = Force coefficient in y direction for J-th vibration mode

SDO(3,J) = Pitching moment coefficient about y-axis for J-th mode

SDO(4,J) = Yawing moment coefficient about z-axis for J-th mode

SDO(5,J) = Rolling moment coefficient about x-axis for J-th mode

Generation: Program MODFIN of the doublet-lattice processor.

DUBLAT BODY SECTIONAL FORCES MATRIX

File: DUBLRNF

Index Name: SFBijkl

Type: MIXED

Dimensions: (4*NUMDBL)*NUMMOD

Where:

NUMDBL = Number of bodies with doublets
NUMMOD = Number of vibration modes

Auxiliary ID:

Word 1:	DUBLRNF
Word 2:	SFBijkl
Word 3:	KVAL (reduced frequency value)
Word 4:	BREF (reference semi-chord)
Word 5:	MACH (Mach number)
Word 6:	SREF (reference semi-span)
Words 7-10:	Zero

Elements: The elements of the complex array SFB(NUMDBL,2*NUMMOD)

Where:

SFB(I,J) = Sectional lift coefficient for the I-th body and J-th vibration mode ($1 \le J \le NUMMOD$)
SFB(I,J) = Sectional moment coefficient for the I-th body and (J-NUMMOD)th vibration mode ($1 \le J-NUMMOD \le NUMMOD$)
NUMDBL = Number of bodies with doublets
NUMMOD = Number of vibration modes

Generation: Program MODFIN of the doublet-lattice processor.

DUBLAT SURFACE SECTIONAL FORCES MATRIX

File: DUBLRNF

Index Name: SFØijkl

Type: REAL

Dimensions: ((4*NUMMOD)*(NUMSPP+NUMSBP))*1

Where:

NUMSPP = Number of strips on the lifting surfaces
NUMSBP = Number of strips on the body interference surfaces
NUMMOD = Number of vibration modes

Auxiliary ID:

Word 1:	DUBLRNF
Word 2:	SFØijkl
Word 3:	KVAL (reduced frequency value)
Word 4:	BREF (reference semi-chord)
Word 5:	MACH (Mach number)
Word 6:	SREF (reference semi-span)
Words 7-10:	Zero

Elements: The elements of the complex array SFO(NUMSPP+NUMSBP, 2*NUMMOD)

Where:

SFO(I,J) = Sectional lift coefficient for the I-th strip and J-th vibration mode ($1 \le J \le NUMMOD$)

SFO(I,J) = Sectional moment coefficient for the I-th strip and (J-NUMMOD)th vibration mode ($1 \le J-NUMMOD \le NUMMOD$)

Generation: Program MODFIN of the doublet-lattice processor.

DUBLAT STRIP GEOMETRY MATRIX

File: DUBLRNF

Index Name: SGCij00

Type: MIXED

Dimensions: (8*(NUMSPP+NUMSBP+1))*1

Where:

NUMSPP = Number of strips on the lifting surface panels
NUMSBP = Number of strips on the body interference panels

Auxiliary ID:
Word 1: DUBLRNF
Word 2: SGCij00
Words 3-10: Zero

Elements:

Item 1:	NUMXS	XSPTR
Item 2:	NUMYS	YSPTR
Item 3:	NUMZS	ZSPTR
Item 4:	NUMDX	DXPTR
Item 5:	NUMDY	DYPTR
Item 6:	NUMDZ	DZPTR
Item 7:	NUMGS	GSPTR
Item 8:	NUMTS	TSPTR
Item TSPTR:	TS (real array)	
Item GSPTR:	GS (real array)	
Item DZPTR:	DZ (real array)	
Item DYPTR:	DY (real array)	
Item DXPTR:	DX (real array)	

2 packed 30 bit integers per word (Items 1–8)

Item ZSPTR:	ZS (real array)
Item YSPTR:	YS (real array)
Item XSPTR:	XS (real array)

Where:

NUMXS	=	Number of strip leading edge centerline X coordinates
NUMYS	=	Number of strip leading edge centerline Y coordinates
NUMZS	=	Number of strip leading edge centerline Z coordinates
NUMDX	=	Number of strip lengths
NUMDY	=	Number of strip widths
NUMDZ	=	Number of strip heights
NUMGS	=	Number of strip dehedrals
NUMTS	=	Number of strip spanwise centerlines as a fraction of panel span
XSPTR	=	Pointer to the first strip leading edge centerline X coordinate, XS(1)
YSPTR	=	Pointer to the first strip centerline Y coordinate, YS(1)
ZSPTR	=	Pointer to the first strip centerline Z coordinate, ZS(1)
DXPTR	=	Pointer to the first strip length, DX(1)
DYPTR	=	Pointer to the first strip width, DY(1)
DZPTR	=	Pointer to the first strip height, DX(1)
GSPTR	=	Pointer to the first strip dihedral, GS(1)
TSPTR	=	Pointer to the first strip spanwise centerline, TS(1)

Generation: Program INPUTG of the doublet-lattice processor.

DUBLAT VELOCITY PROFILE MATRIX

File: DUBLRNF

Index Name: VPCij00

Type: MIXED

Dimensions: (NUMBBp+NUMBBP+1)*1

Where:

NUMBPP = Number of boxes on the lifting panels
NUMBBP = Number of boxes on the body interference panels

Auxiliary ID:
Word 1: DUBLRNF
Word 2: VPCij00
Words 3-10: Zero

Elements: Item i contains the real valued velocity ratio, V_L/V_∞ , for the i-th box number.

(V_L/V_∞ = 1.0 by default.)

Generation: Program INPUTG of the doublet-lattice processor.

EXTRACT NAME LIST MATRIX

File:	EXTRRNF	
Index Name:	DBEXTNM	
Type:	MIXED	
Dimensions:	N*1 where N = Number of extract commands	
Auxiliary ID:	Word 1:	EXTRRNF
	Word 2:	DBEXTNM
	Words 3-10:	Zero
Elements:	The i-th word of this matrix contains the following information for the ith user defined extract command.	
	Bits 59-18:	Alphanumeric name assigned to the ith extract command. (left adjusted, blank filled)
	Bits 17-0:	Integer equal to the number of data matrices written out for the ith extract command.
Generation:	Program EXCON of the extract processor.	

DATA BASE INDEX NAME MATRIX

File: EXTRRNF

Index Name: DBINDEX

Type: MIXED

Dimensions: 17 x 1

Auxiliary ID:

Word 1:	EXTRRNF
Word 2:	DBINDEX
Words 3-10:	Zero

Elements: Each word contains a basic attribute name (42 bits, blank filled) and an integer number used to identify the data items and indicate the number of bits there are to be assigned to the field that will contain the attribute values in the index. The order of attributes in this matrix represents the index sorting order.

The contents of this matrix are as follows:

Row	Bits 59–18	Bits 17–0
1	EXNAM	6
2	STIFSET	6
3	MASSSET	6
4	STAGE	6
5	LCNAM	12
6	MODE	12
7	CASE	6
8	ALTITUD	6
9	SUBSNAM	24
10	DATNAM	12
11	PCOND	12
12	CCOND	12
14	CSET	6
15	RSET	6
16	COND	6
17	CYCLE	12

Generation: Program EXCON of the extract processor.

EXTRACT CONTROL MATRIX

File:	EXTRRNF	
Index Name:	DBEXCØN	
Type:	MIXED	
Dimensions:	M*1 where M≤3000	
Auxiliary ID:	Word 1:	EXTRRNF
	Word 2:	DBEXCØN
	Words 3-10:	Zero

Elements: Words 1 thru N where N is the row dimension of matrix DBEXTNM, contain the following information, one word per extract command.

Bits 59-48:	Pointer (p) to the word in this matrix at which the extract control information starts.
Bits 47-42:	Number of attributes related to the extracted data.
Bits 41-36:	Number of words (k1) required to store the values and the usage type of the related attributes.
Bits 35-30:	Number of attributes that are used in forming the matrix index names for the extracted data.
Bits 29-24:	Number of words (k2) required to store the bit field location in the matrix index name for the attributes used.
Bits 23-18:	Number of attributes whose values or the values of whose components are used in formulating the INDICES in the keys for the extracted data.

Bits 17-12: Number of words (k3) required to store the bit field locations in the INDICES for the attributes used.

Bits 11-0: Length (k4) of the extracted data detail.

Item P contains the following information:

Bits 59-9: 17 3 bit integers left to right, representing the 17 attributes contained in the DBINDEX matrix.

Each of the 17 integers have values between 0 and 4. They are interpreted as follows:

0 = This attribute is not related to the extracted data.

1 = This attribute is related to the extracted data and its value is not used in identifying the extracted data.

2 = This attribute is related to the extracted data and its value is used in the matrix index name for the extracted data matrices.

3 = This attribute is related to the extracted data and its value is used in the INDEX in the keys contained in the extracted data matrices.

4 = This attributes is related to the extracted data and the values of its components are used in the INDEX in the keys contained in the extracted data matrices.

Bits 8-0: Reserved

Items (P + 1) thru Q (Q = P+k1) contain the following information:

Item (P + i) contains the attribute value (integer) for the ith attribute that is associated with the extracted data.

Items (Q + 1) thru R (R = Q+k2) contain the following information:

Each word contains up to 10 6 bit integers. Each pair, from left to right, relates to an attribute that has a value of 2 in word P. The left word in one such word pair contains the position of the leftmost bit of the field that is occupied by the value of the attribute in the matrix index name. The right word in the word pair contains the position of the rightmost bit of the field. Each word contains information for up to 5 attributes.

Items (R + 1) thru S (S = R+k3) contain the following information:

Each word contains up to 10 6 bit integers as in words (Q + 1) thru R. Each pair, from left to right, relates to an attribute that has a value of 3 or 4 in word P. The left word in one such pair contains the position of the leftmost bit of the field that is occupied by the value of the attribute or its component in the index in the keys. The right word contains the position of the rightmost bit of the field.

Items (S + 1) thru T (T = S+k4) contain the following information related to the nature of the extracted data that are associated with nodes and finite elements. k4 is 112 words long and is composed of 14 blocks of 8 words. The first 8 words contain the following information:

Word S+1 contains the number of nodes for which data is extracted.

Words S+2 thru S+8 contain the selection pattern of the extracted data for node related items with codes = the 0 thru 6 respectively. The selection pattern is indicated by switching on bits from left to right for up to 60 items representing sequence numbers 1 thru 60. The sequence numbers are specified in the ATLAS data directory (ADATDIR).

The subsequent 13 8 word blocks contain information identical to the above for finite element types 1 thru 13.

Generation: Program EXDATA of the extract processor.

EXTRACTED DATA MATRICES

File: EXTRRNF

Index Name: DB001rr,DB002rr,....,DB999rr

Type: MIXED

Dimensions: M * 1 where M ≤ 3000

Auxiliary ID:

Word 1:	EXTRRNF
Word 2:	The matrix index name.
Words 3-10:	Zero

Elements:

Item 1:

Bits 59-30:	Reserved
Bits 29-15:	Number of keys contained in this matrix.
Bits 14-0:	Lowest key in this matrix

Item 2-(NR+1):

Bits 59-48:	Pointer to the data body associated key.
Bits 47-36:	Length of the data body associated with this key.
Bits 35-0:	INDEX formed out of the attribute values.

Item (NR+2)-M:

Data body.

Generation: Program REORDAT of the extract processor.

EXTRACTED DATA KEY INDEX MATRIX

File:	EXTRRNF
Index Name:	DBINDrr
Type:	MIXED
Dimensions:	M * 1 where M ≤ 3000
Auxiliary ID:	Word 1: EXTRRNF Word 2: DBINDrr Words 3-10: Zero
Elements:	Word i contain in bits 35-0 the INDEX in word 2 of the ith partition of the extracted data matrix, DB00irr.
Generation:	Program REORDAT of the extract processor.

SUBSET NAME LIST MATRICES

File: EXTRRNF

Index Name	Parameter	Attribute	Subset	Notes
LCNMLST	LC	LCNAM	LCNM001	1
MDNMLST	MØDE	MØDE	MDNM001	1
CANMLST	CASE	CASE	CANM001	1
ALNMLST	ALT	ALTITUD	ALNM001	1
SUBSLST	NSUB	SUBSNAM	SNKddda	2
SUBSLST	ESUB	SUBSNAM	SEKddda	2
SUBSLST	ESUB	SUBSNAM	SEMddda	2
SUBSLST	BSUB	SUBSNAM	SPKddda	2
SDTNLST	LSUB	DATNAM	SITM001	3
CSNMLST	CSET	CSET	CSNM001	1
RSNMLST	RSET	RSET	RSNM001	1
CØNMLST	CØND	CØND	CØNM001	1
CYNMLST	CYCLE	CYCLE	CYNM001	1

1 Subset names assigned by the program

2 Subset names predefined by input preprocessor

3 Subset names predefined by input preprocessor or assigned by the program

Type: MIXED

Dimensions: M*1 where M = the number of EXECUTE EXTRACT statements that contain the corresponding parameter.

Auxiliary ID:
Word 1: EXTRRNF
Word 2: The matrix index name
Words 3-10: Zero

Elements: The elements of these matrices are the index names for the subset matrices created for each CATlist in an EXECUTE EXTRACT (Parameter = CATlist) statement. The first name is ****001 and the numeric field is incremented by 1 for every subsequent subset defined thru an EXECUTE EXTRACT command.

Generation: Program EXCON of the extract processor.

SUBSET MATRICES - TYPE 1

File: EXTRRNF

Index Name	Parameter	Attribute
LCNM001	LC	LCNAM
MDNM001	MØDE	MØDE

Type: MIXED

Dimensions: M*2 where M is the number of attributes specified by the CATlist parameter is the EXECUTE EXTRACT statement.

Auxiliary ID:

Word 1:	EXTRRNF
Word 2:	The matrix index name
Words 3-10:	Zero

Elements: Column 1 contains the integer values of the items of the subset specified by Parameter = CATlist in the EXECUTE EXTRACT statement.

Column 2 contains the loadcase userids (LCNM001) or the frequency (MDNM001) in display code.

Generation: Program EXCON of the extract processor.

SUBSET MATRICES - TYPE 2

File: EXTRRNF

Index Name	Parameter	Attribute
CANM001	CASE	CASE
AINM001	ALT	ALTITUD
XSNM001	CSET	CSET
RSNM001	RSET	RSET
CØNM001	CØND	CØND
CYNM001	CYCLE	CYCLE

Type: MIXED

Dimensions: M*1 where M is the number of attributes specified by the CATlist parameter is the EXECUTE EXTRACT statement.

Auxiliary ID:

Word 1:	EXTRRNF
Word 2:	The matrix index name
Words 3-10:	Zero

Elements: Item i contains the integer value of the ith item of the subset specified by Parameter = CATlist in the EXECUTE EXTRACT statement.

Generation: Program EXCØN of the extract processor.

LABEL SUBSET MATRIX

File:	EXTRRNF
Index Name:	SITM001
Type:	MIXED
Dimensions:	(N+59)/60, where N = Number of labels in the label subset.
Auxiliary ID:	Word 1: EXTRRNF Word 2: SITM001 Words 3-10: Zero
Elements:	The i-th bit of this vector corresponds to the i-th label in the ATLAS DATA DIRECTORY (matrix ADATDIR). Bit 1 is the leftmost bit of the first word, bit 60 is the rightmost bit of the first word, bit 61 is the leftmost bit of the second word etc. If the i-th label is included in the subset, the i-th bit is set to 1. Otherwise the bit is set to zero.
Generation:	Program EXCON of the entract processor or program SETDEFN of the subset definition processor.

BOUNDARY DEFINITION SUBSET MATRIX

File:	EXTRRNF	
Index Name:	SPKddda	
Type:	MIXED	
Dimension:	M*1 where M = (Number of nodes in the ordered subset + 3)/4	
Auxiliary ID:	Word 1:	EXTRRNF
	Word 2:	The matrix index name
	Words 3-10:	Zero
Elements:	The node internal id's are stored 4 per word in the order specified on the subset definition command (storage is left to right, word 1 to word m)	
Generation:	Program EXCON of the extract processor.	

FLEXAIR DATA CASE CONTROL MATRIX

File:	FLEXRNF	
Index Name:	xxxxx	
Type:	MIXED	
Dimensions:	(NKVAL+NALT+11)*1 where NKVAL is the number of output generalized air force matrices (the number of output K-values) and NALT is the number of altitudes.	
Auxiliary ID:	Word 1:	FLEXRNF
	Word 2:	Matrix index name
	Word 3:	MACH, Mach number
	Words 3-10:	Zero
Elements:	Items 1-6 each contain 2 packed 30 bit integers defined as follows:	
Item 1:	Bits 59-30:	The number of constants (2)
	Bits 29-0:	Pointer to the row containing the first constant (7)
Item 2:	Bits 59-30:	The number of output K-values (NKVAL)
	Bits 29-0:	Pointer to the row containing the first K-value (12)
Item 3:	Bits 59-30:	The number of Mach numbers (1)
	Bits 29-0:	Pointer to the row containing the Mach number (9)
Item 4:	Bits 59-30:	The number of problem size numbers (1)
	Bits 29-0:	Pointer to the row containing the problem size number (10)
Item 5:	Bits 59-30:	The number of matrix size numbers (1)

	Bits 29-0:	Pointer to the row containing the matrix size number (11)
Item 6:	Bits 59-30:	The number of altitudes (NALT)
	Bits 29-0:	Pointer to the row containing the first altitude

Item 7: BREF, Reference length for the reduced frequency

Item 8: SPAN/2

Item 9: MACH, the Mach number

Item 10: NMODES, the number of modes

Item 11: 2*NMODES*NMODES, the size of the generalized air force matrices

Items 12 - (NKVAL+11) contain the NKVAL output K-values for which generalized air forces are prepared.

Items (12+NKVAL)-(NKVAL+NALT+11) contain the NALT altitudes for which generalized airforce matrices are output.

<u>Generation</u>: Program FLEXAIR of the residual flexibility processor.

GENERALIZED AIRFORCE MATRIX

File:	FLEXRNF
Index Name:	xxxxxyy
Type:	REAL
Dimensions:	(2*NMODES)*NMODES (NMODES*NMODES complex) where NMODES is the number of mode shapes.
Auxiliary ID:	Word 1: FLEXRNF Word 2: Matrix index name Word 3: Mach Number Word 4: BREF Words 5-10: Zero
Elements:	Element (i,j) represent the force on the ith coordinate resulting from unit oscillatory motion of the jth coordinate, divided by $(-1/2)\rho V^2$ where ρ = air density, V = velocity.
Generation:	Program FLEXAIR of the residual flexibility processor.

FLUTTER EIGENSOLUTION DATA MATRIX

File: FLUTRNF

Index Name: Fiupvjw

Type: MIXED

Dimensions: (NTØT*1) where:

NTØT	=	32 + NEL + NRFE * (2+4*NEL)
NEL	=	Number of elements in retention vector set
NRFE	=	Number of non zero eigenvalues (NRFE ≤ NEL)

Auxiliary ID:

Word 1:	FLUTRNF
Word 2:	Fiupvjw
Words 3-10:	Zero

Elements: This matrix contains the eigenvalues, normal eigenvectors and adjoint eigenvectors at one of the user specified reduced frequencies.

Item 1-8: 8 word user case title.

Item 9-16: 8 word changeset title.

Item 17: Run data

Item 18: Problem identifier iupvj

Item 19: Number of degrees of freedom

Item 20: Mach number

Item 21: Non zero simulation density

Item 22: Reference length

Item 23: Units system for input data

Item 24: Retention vector set number

Item 25: Number of elements in the retention set (NEL)

Item 26-(25+NEL):

Element numbers of the retention set

Item (26+NEL):

Altitude

Item (27+NEL):

Number of non zero eigenvalues (NRFE)

Item (28+NEL):

Reduced frequency

Item (29+NEL):

Index for eigenvalues at this k value

Item (30+NEL) - (29+NEL+NRFE*2):

Complex non zero eigenvalues

Item (30+NEL+2*NRFE):

Index for normal eigenvectors at this k value.

Item (31+NEL+2*NRFE) - (30+NEL+2*NRFE+2*NEL*NRFE):

Complex normal eigenvectors

Item (31+NEL+2*NRFE+2*NEL*NRFE):

Index for adjoint eigenvectors at this k value.

Item (32+NEL+2*NRFE+2*NEL*NRFE) - (32+NEL+2*NRFE+4*NEL*NRFE):

Complex adjoint eigenvectors

Generation: Program FLUSOL of the flutter processor.

FLUTTER OUTPUT CONTROL DATA MATRIX

File: FLUTRNF

Index Name: FLBCij

Type: MIXED

Dimensions: (NWDST*1) where NWDST = 2* (number of problems solved) + 1

Auxiliary ID: Words 1-10: Zero

Elements:

Item 1: Number of flutter problems successfully completed for this case (NWDS)

Item 2:

Bits 59-48:	Reserved
Bits 47-42:	Case Number
Bits 41-36:	Changeset number
Bits 35-30:	Retention set number
Bits 29-24:	Altitude number
Bits 23-18:	Condition number
Bits 17-0:	Reserved

Item 2 is repeated for all problems solved (NWDS words)

Item (NWDS+2):

Altitude of first problem

Item (NWDS+2) is repeated for all problems solved (NWDS words). The latter portion of this matrix is used in the flutter optimization module.

Generation: Program FLUSOL of the flutter processor.

FLUTTER PLOT CONTROL MATRIX

File: FLUTRNF

Index Name: FPiupvj

Type: MIXED

Dimensions: NPCOT * 1 where:

NPCOT = 22 + NMODES
NMODES = Number of degrees of freedom

Auxiliary ID:

Word 1:	FLUTRNF
Word 2:	FPiupvj
Words 3-10:	Zero

Elements: The matrix contains the general data required for producing v-g and V-f plots for the specified altitude. The plot data is contained in the matrix FPiupvjx where x is the partition number.

Item 1-8: 8 word user title

Item 9: Run date

Item 10: Problem identifier

Bits 59-30:	Reserved
Bits 29-24:	Condition number
Bits 23-18:	Altitude number
Bits 17-12:	Retention set number
Bits 11-6:	Changeset number
Bits 5-0:	Case number

Item 11: Number of degrees of freedom

Item 12: Mach number

Item 13: Number of unique reduced frequencies

Item 14: Altitude

Item 15: Reference length

Item 16: Units system

Item 17: Number of eigenvalues found (N)

Item 18: Total number of reduced frequencies

Item 19: Number of partitions of plot data matrix

Item 20: Not used

Item 21: Retention vector set number

Item 22: Number of elements of retention set (NEL)

Item 23-(22+NEL):

Degrees of freedom retained

Generation: Program FLUSOL of the flutter processor.

FLUTTER PLOT DATA MATRIX

File: FLUTRNF

Index Name: FPiupvjx where x is the record number

Type: MIXED

Dimensions: NPTOT * 1 where

```
NPTOT = NRFB * (2+2*N)
NRFB  = Number of reduced frequencies in this
        partition
N     = Number of eigenvalues
```

Auxiliary ID:

```
Word 1:       FLUTRNF
Word 2:       FPiupvjx
Word 3-10:    Zero
```

Elements: The matrix contains the plot data for generating V-g and V-f plots. One or more records may be generated for each altitude.

Item 1: Reduced frequency

Item 2: Flag (=1) for original reduced frequency

Item 3-(2+2*N):

Complex eigenvalues of V-g solution

Item (3+2*N)-(NRFB*(2+2*N)):

Items 1-(2+2*N) are repeated for all NRFB reduced frequencies.

Generation: Program FLUSOL of the flutter processor.

FLUTTER OUTPUT PRINT DATA MATRIX

File: FLUTRNF

Index Name: FRiupvj

Type: MIXED

Dimensions: NTOT * 1 where:

NTØT = 45+NMØDES+NFLMØDE*(EXP)
EXP = 9*IGC+(IVECA+IVECB*NEL+IVECC*NEL)*(12+6*NEL)

IGC = Number of crossing levels
IVECA = Flag for eigenvalues at flutter
IVECB = Flag for normal vectors at flutter
IVECC = Flag for adjoint vectors at flutter
NEL = Number of elements in retention set excluding rigid body, oscillatory and zero eigenmodes.
NFLMODE = Total number of crossings
NMODES = Number of degrees of freedom

Auxiliary ID:

Word 1: FLUTRNF
Word 2: FRiupvj
Words 3-10: Zero

Elements:

Items 1-8: 8 word user case title

Items 9-16: 8 word user changeset title

Item 17: Run date

Item 18: Problem identifier iupvj

Item 19: Number of degrees of freedom

Item 20: Mach number

Item 21: Checkout print flag

Item 22: Matched point solution index

Item 23: Number of altitudes

Item 24: Number of Laguerre iterations

Item 25: Still air mode solution index

Item 26: Units system for input data

Item 27: Plot flag

Item 28: 1-7 character name of mass matrix

Item 29: 1-7 character name of stiffness matrix

Item 30: 5 character name of airforce matrix

Item 31: Number of reduced frequencies

Item 32: Non zero simulation density

Item 33: Flutter envelope minimum speed

Item 34: Flutter envelope maximum speed

Item 35: Flutter envelope miminum frequency (Hz)

Item 36: Flutter envelope maximum frequency (Hz)

Item 37: Retention vector set identifier

Item 38: Number of elements in the retention vector

Item 39-(38+NEL):

Element numbers in the retention vector

Item (39+NEL):

Altitude

Item (40+NEL):

Airspeed

Item (41+NEL):

Mass ratio

Item (42+NEL):

Number of damping levels (IGC)

Item (43+NEL):

Number of "crossings" in this matrix (NFLMODE)

Item (44+NEL):

First damping level

Item (45+NEL):

Second damping level

Item (46+NEL):

Third damping level

Item (47+NEL):

Damping level (g) (GLEV)

Item (48+NEL):

Mode number

Item (49+NEL):

Reduced frequency (k)

Item (50+NEL):

Speed index (FSI)

Item (51+NEL):

Frequency

Item (52+NEL):

Airspeed

Item (53+NEL):

$\partial g/\partial k$

Item (54+NEL):

$\partial FSI/\partial g$

Item (55+NEL):

Pointer to the beginning of data for the next crossing.

Items (47+NEL) to (55+NEL) are repeated for each crossing (NFLMODE modes)

The items following are included in this matrix if eigenvalues, normal and/or adjoint eigenvectors are requested at flutter. These items are omitted for non zero damping levels.

Item (56+NEL):

Index for eigenvalues at flutter (IVECA)

Item (57+NEL):

Real part of eigenvalues at current k value

Item (58+NEL):

Imaginary part of eigenvalues at current k value

Item (59+NEL):

Current reduced frequency (k value)

Items (56+NEL) - (59+NEL) are repeated for the previous and flutter reduced frequencies.

Items (60+NEL):

Index for normal eigenvectors at flutter (IVECB)

Items (61+NEL) - (63+NEL):

Complex eigenvalue and current reduced frequency

Items (64+NEL) - (63+3*NEL):

Normal eigenvectors at current reduced frequency

Items (60+NEL) - (63+3*NEL) are repeated for the previous and flutter reduced frequencies. For the adjoint eigenvectors at flutter, the items (60+NEL) - (63+3*NEL) are repeated at the current, previous and flutter reduced frequencies.

Generation: Program FLUSOL of the flutter processor.

INTERPOLATION COEFFICIENT MATRIX FOR SURFSPLINE

File: INTERNF

Index Name: Cddd

Type: MIXED

Dimensions: M * 1 where:

M	=	17+2NIPTS+(NIPTS+3)*(NCOLS+2)+NSK
NIPTS	=	Number of input points
NCOLS	=	MCOLN - MCOL1 + 1
NSK	=	0, when INDS = 0
	=	1, when INDS = 1
	=	NIPTS when INDS = 2

Auxiliary ID:

Word 1:	INTERNF	
Word 2:	Cddd	
Word 3:	ITx	
Word 4:	ITy	
Word 5:	ITz	DOF indicators
Word 6:	IRx	
Word 7:	IRy	
Word 8:	IRz	
Word 9:	Z - location of plane	
Word 10:	Zero	

Elements:

Item 1: M, the number of items in this matrix

Item 2: 10HSURFSPLINE

Item 3: IPOINT, pointer to the transformation matrix, (=0 - no transformation matrix)

Item 4: MCOLS, total number of modes

Item 5: MCOL1, modes 1 thru MCOL1 will be zero on output modes

Item 6: MCOLN, (MCOLN-MCOL1+1) is the number of input modes and modes MCOLN+1 thru MCOLS will be zero on output

Item 7: NIPTS, number of input points

Item 8: 14+NSK, pointer to input points x, y coordinates (NPCOOR)

Item 9: 14+NSK+2*NIPTS+2+(NIPTS+3), pointer to first spline coefficient (NPCOEF)

Item 10: XBAR, x cg location

Item 11: YBAR, y cg location

Item 12: COST, cosine of the rotation angle

Item 13: SINT, sine of the rotation angle

Item 14: RGU, Ru (radius of gyration)

Item 15: RGV, Rv (radius of gyration)

Item 16: INDS, Smoothing indicator
0--no smoothing
1--applies to all input points

Item 17-NPCOOR:

SK values if present

Item (NPCOOR)-(NPCOOR+2*NIPTS):

U, V transformed representation of input points

Item (NPCOOR+2*NIPTS+1)-(NPCORF-1):

Scratch area of 2*(NIPTS+3)

Item (NPCORF)-(NPCOEF+N):

Spline coefficients where
N = (NIPTS+3)*NCOLS-1

Item (NPCOEF+N+1)-(NPCOEF+N+ITRAN):

Transformation matrix location (if specified)
where ITRAN = 12 if matrix exists
= 0 if matrix does not exist

Item (NPCORF+N+ITRAN+1):

10HSURFSPLINE

<u>Generation</u>: Program SURFSPL of the interpolation processor.

INTERPOLATION COEFFICIENT MATRIX FOR MOTIONAXIS

File: INTERNF

Index Name: Cddd

Type: MIXED

Dimensions: M * 1 where:

M	=	9+4*NMADP+6*NSEG+NMS+6*NMS*NCOLS+3*NCOLS
NMADP	=	Number of motion axis definition points
NSEG	=	NMADP-1
NMS	=	Number of motion stations (input points
NCOLS	=	MCOLN-MCOL1+1

Auxiliary ID:

Word 1:	INTERNF	
Word 2:	Cddd	
Word 3:	ITx	
Word 4:	ITY	
Word 5:	ITz	DOF indicators
Word 6:	IRx	
Word 7:	IRy	
Word 8:	IRz	
Word 9:	Z--location of plane	
Word 10:	Zero	

Elements:

Item 1: M, the number of items in this matrix

Item 2: 10HMOTIONAXIS

Item 3: IPOINT, pointer to the transformation matrix, (=0--no transformation matrix)

Item 4: MCOLS, total number of modes

Item 5: MCOL1, modes 1 through MCOL1 will be zero on output

Item 6: MCOLN, the number of input modes and modes MCOLN+1 through MCOLS will be zero on output

Item 7: NMADP, number of motion axis definition points

Item 8: NMS, number of motion stations

Item 9-(8+NMADP):

XMA, x-coordinates of the motion axis definition points

Item (8+NMADP+1)-(8+2*NMADP):

XMA, y-coordinates of the motion axis definition points

Item (8+2*NMADP+1)-(8+3*NMADP):

DYDXRL, slope dy/dx of the reference lines through the definition points

Item (8+3*NMADP+1)-(8+4*NMADP):

SMA, arc length along motion axis for the i-th definition points

Item (8+4*NMADP+1)-(8+4*NMADP+NSEC):

XMAP, x mapping point for the i-th segment

Item (8+4*NMADP+NSEG+1)-(8+4*NMADP+2*NSEG):

YMAP, y mapping point for i-th segment

Item (8+4*NMADP+2*NSEG+1)-(8+4*NMADP+3*NSEG):

C_0, cubic coefficient for the i-th segment

Item (8+4*NMADP+3*NSEG+1)-(8+4*NMADP+4*NSEG):

C_1, cubic coefficient for the i-th segment

Item (8+4*NMADP+4*NSEG+1)-(8+4*NMADP+5*NSEG):

C_2, cubic coefficient for the i-th segment

Item (8+4*NMASP+5*NSEG+1)-(8+4*NMADP+6*NSEG):

C_3, cubic coefficient for the i-th segment

Item (8+4*NMADP+6*NSEGH)-(8+4*NMADP+6*NSEG+NMS):

Sms, arc length from first node to motion stations

The next block of data contains the modal displacements at the i-th input point for the j-th mode. (N1=8+4*NMADP+6*NSEG+NMS).

Item (N1+1)-(N1+NMS*NCOLS):

TZ

Item (N1+NMS*NCOLS+1)-(N1+2*NMS*NCOLS):

RX

Item (N1+2*NMS*NCOLS+1)-(N1+3*NMS*NCOLS):

RY

Item (N1+3*NMS*NCOLS+1)-(N1+4*NMS*NCOLS):

dTz/ds

Item (N1+4*NMS*NCOLS+1)-(n1+5*NMS*NCOLS):

dRx/ds

Item (N1+5*NMS*NCOLS+1)-(N1+6*NMS*NCOLS):

dRy/ds

Item (M1+1)-(M1+3*NCOLS):

Scratch area where M1=N1+6*NMS*NCOLS

Item (M1+3*NCOLS+1)-(M1+3*NCOLS+ITRAN):

ITRFN followed by the transformation matrix location (if spectified)
where ITRAN = 12 is matrix exists
= 0 is matrix does not exist

Item (M1+3*NCOLS+ITRAN+1):

10HMOTIONAXIS

Generation: Program MOTIONA of the interpolation processor.

INTERPOLATION COEFFICIENT MATRIX FOR MOTIONPT

File: INTERNF

Index Name: Cddd

Type: MIXED

Dimension: M*1 where M=9+6*(MCOLN-MCOL1+1)+ITRAN+1

Auxiliary ID:

Word 1:	INTERNF	
Word 2:	Cddd	
Word 3:	ITx	
Word 4:	ITy	
Word 5:	ITz	DOF indicators
Word 6:	IRx	
Word 7:	IRy	
Word 8:	IRz	
Words 9-10:	Zero	

Elements:

Item 1: M, number of items in this matrix

Item 2: 8HMOTIONPT

Item 3: IPOINT, pointer to the transformation matrix (=0--no transformation matrix)

Item 4: MCOLS, total number of output modes

Item 5: MCOL1, models 1 through MCOL1 will be zero on output

Item 6: MCOLN, (MCOLN-MCOL1+1) is the number of input modes and modes MCOLN+1 through MCOLS will be zero on output

Item 7: X, reference point x-coordinate

Item 8: Y, reference point y-coordinate

Item 9: Z, reference point z-coordinate

Item 10:   TX, translation in X

Item 11:   TY, translation in Y

Item 12:   TZ, translation in Z

Item 13:   RX, rotation in X

Item 14:   RY, rotation in Y

Item 15:   RZ, rotation in Z

Item 16-(9+6*NCOLS):

The translation and rotations are repeated for each mode. (NCOLS=NCOLN-MCOL1+1)

Item (9+6*NCOLS+1)-(9+6*NCOLS+ITRAN):

ITRAN followed by the transformation matrix location (if specified)
where ITRAN = 12 if matrix exists
= 0 if matrix does not exist

Item (9+6*NCOLS+ITRAN+1):

8HMOTIONPT

Generation: Program MOTIONP of the interpolation processor.

INTERPOLATION COEFFICIENT MATRIX FOR POLYNOMIAL

File:	INTERNF		
Index_Name:	Cddd		
Type:	MIXED		
Dimension:	M*1 where M=7+N*NCOLS+1		
Auxiliary_ID:	Word 1:	INTERNF	
	Word 2:	Cddd	
	Word 3:	ITx	
	Word 4:	ITy	
	Word 5:	ITz	
	Word 6:	IRx	DOF indicators
	Word 7:	IRy	
	Word 8:	IRz	
	Words 9-10:	Zero	

Elements:

Item 1: M, number of items in this matrix

Item 2: 10HPOLYNOMIAL

Item 3: IPOINT, pointer to the transformation matrix (=0--no transformation matrix)

Item 4: MCOLS, total number of modes

Item 5: MCOL1, modes 1 thru MCOL1 will be zero on output

Item 6: MCOLN, (MCOLN-MCOL1+1) is the number of input modes and modes MCOLN+1 thru MCOLS will be zero on output

Item 7: IDEG, the highest degree of polynomial

Item 8-(7+N):

Polynomial coefficients for mode 1 where N={(IDEG+1)*(IDEG+2)}/2

Item (8+N)-(7+N*NCOLS):

The coefficients are repeated for each mode. (NCOLS=NCOLN-MCOL1+1).

Item (7+N*NCOLS+1):

10HPOLYNOMIAL

Generation: Program POLY of the interpolation processor.

INTERPOLATION COEFFICIENT MATRIX FOR BEAMSPLINE

File: INTERNF

Index Name: Cddd

Type: MIXED

Dimensions: M * 1 where:

```
M = 17+6*NNODES+13*NBEAM+((INDC+3)/2)*2*NNODES*NCMOD
NNODES =  Number of nodes
NBEAM  =  Number of beams
INDC   =  Indicator for rotation routine
       =   1, x-rotation
       =   2, y-rotation
       =   3, both x- and y-rotations
NCMOD  =  Number of nodes
```

Auxiliary ID:

```
Word 1:      INTERNF
Word 2:      Cddd
Word 3:      ITx
Word 4:      ITy
Word 5:      ITz
Word 6:      IRx        DOF indicator
Word 7:      IRy
Word 8:      IRz
Word 9:      Z - location of plane
Word 10:     Zero
```

Elements:

Item 1: M - number of elements in this matrix

Item 2: 10HBEAMSPLINE

Item 3: IPOINT - Pointer to tranformation matrix
= 0, no transformation matrix
= Item 9+N+1 - tranformation matrix location.

Item 4: NCOLS - total number of modes

Item 5: MCOL1 - modes up to MCOL1 but not including MCOL1 are zeros.

Item 6: MCOLN - (MCOLN-MCOL1+1) is the number of input modes. Modes MCOLN+1 through MCOLS are zeros.

Item 7: NPTS, the sum of the number of points defining all beams NPTS $\geq$ 4

Item 8: NBMS, the total number of beams defined for the analysis NBMS $\geq$ 2

Item 9: INDC, indicator for retained freedoms present in this array.
0, TZ only
1, TZ and RX
2, TZ and RY
3, TZ, RX, and RY

Item 10-15: Reserved for future use.

Item 16-(15+NBMS+1):

Beam pointer array, the I-th element of this array points to the elements of other arrays corresponding to the first point of the I-th beam specified.

Item (15+NBMS+2)-(15+2*NBMS+1):

Beam extrapolation code array, the I-th element of this array contains the extrapolation code for the I-th beam.

Item (15+2*NBMS+2) - (15+2*NBMS+NPTS+1):

Input point Y-coordinates.

Item (15+2*NBMS+NPTS+2) - (15+2*NBMS+2*NPTS+1):

Arc length array

Item (15+2*NBMS+2*NPTS+2) - (15+2*NBMS+2*NPTS+NSEG+1):

C0, the first cubic coefficient for the cubic splines defined on the beam segments.
NSEG = NPTS - NBMS

Item (15+2*NBMS+2*NPTS+NSEG+2)-(15+2*NBMS+2*NPTS+2*NSEG+1):

C1, the second cubic coefficient for the cubic splines defined on the beam segments.

Item (15+2*NBMS+2*NPTS+2*NSEG+2)-(15+2*NBMS+2NPTS+3*NSEG+1):

C2, the third cubic coefficient for the cubic splines defined on the beam segment.

Item (15+2*NBMS+2*NPTS+3*NSEG+2)-(15+2*NBMS+2*NPTS+4*NSEG+1):

C3, the fourth cubic coefficient for the cubic splines defined on the beam segment.

Item (15+2*NBMS+2*NPTS+4*NSEG+2)-(15+2*NBMS+2*NPTS+4*NSEG+NDEF+1):

Z - translation mode shapes.
NDEF = NPTS * number of modes.

Item (15+2*NBMS+2*NPTS+4*NSEG+NDEF+2)-(15+2*NBMS+2*NPTS+4*NSEG+2*NDEF+1):

z-rotation (slopes) mode shapes.

Item (15+2*NBMS+2*NPTS+4*NSEG+2*NDEF+2)-(15+2*NBMS+2*NPTS+4*NSEG+3*NDEF+1):

X = translation mode shapes.

Item (15+2*NBMS+2*NPTS+4*NSEG+3*NDEF+2)_(15+2*NBMS+3*NPTS+4*NSEG+4*NDEF+1):

X - rotation mode shpaes.

Item (15+2*NBMS+2*NPTS+4*NSEG+4*NDEF+2)-(15+2*NBMS+2*NPTS+4*NSEG+5*NDEF+1):

Y - translation mode shapes.

Item (15+2*NBMS+2*NPTS+4*NSEG+5*NDEF+2)-(15+2*NBMS+2*NPTS+4*NSEG+6*NDEF+1):

Y - rotation mode shapes.

Item (15+2*NBMS+2*NPTS+4*NSEG+6*NDEF+2)-(15+2*NBMS+2*NPTS+4*NSEG+6*NDEF+15*NBMS+1):

Scratch area for temporary storage

Item (15+2*NBMS+2*NPTS+4*NSEG+6*NDEF+15*NBMS+2):

10HSURFSPLINE

Generation: Program BEAMSPL of the interpolation processor.

INTERPOLATION TABLE

File:	INTERNF
Index Name:	INTABLE
Type:	MIXED
Dimensions:	3*NCOEF Where NCOEF is the number of coefficients generated by the interpolation utility module
Auxiliary ID:	Word 1: INTERNF Word 2: INTABLE Words 3-10: Zero
Elements:	Each column of this matrix is associated with a coefficient matrix. A typical column contains:
Item 1:	Coefficient matrix index name
Item 2:	Number of words in the coefficient matrix
Item 3:	Number of modes contained in the coefficient matrix
Generation:	Program SURFSPL, MOTIONA, MOTIONP, POLY, or BEAMSPL of the interpolation module.

SPECIFIED DISPLACEMENT MATRIX

File:	LOADRNF
Index Name:	DA001ba, DA002ba, ..., DA999ba
Type:	MIXED
Dimensions:	N*1 where N equals the block size (default 3000)
Auxiliary ID:	Word 1: LOADRNF Word 2: The matrix index name Words 3-10: Zero
Elements	The first word in each block consists of a keyword for merge: 4LDISP OR 10000B The remaining elements consist of word pairs defining the specified displacement to be merged.
Item i:	Bits 59-48: Internal loadcase number Bits 47-36: Internal node number Bits 35-30: Freedom number Bits 29-0: Zero
Item i+1:	Value of displacement
Generation:	Program DISP of the loads processor.

LOAD CASE CORRESPONDENCE TABLE

File: LOADRNF

Index Name: DCØØRba

Type: MIXED

Dimensions: 11*N where N is the number of load cases

Auxiliary ID:
Word 1: LOADRNF
Word 2: DCØØRba
Words 3-10: Zero

Elements: The i-th column contains the following data for the i-th loadcase.

Item 1: User ID for internal loadcase i

Item 2-11: 10 word BCD title for internal loadcase i

Generation: Program COOR of the loads processor.

ELEMENT TEMPERATURE MATRIX

File:	LOADRNF	
Index Name:	EL001ba, ..., EL999ba	
Type:	MIXED	
Dimensions:	N * 1 where N equals the block size	
Auxiliary ID:	Word 1:	LOADRNF
	Word 2:	The matrix index name
	Words 3-10:	Zero
Elements:	The first item in each partition consists of:	
	Bits 59-31:	Zero
	Bits 30-15:	Number of elements in this partition
	Bits 14-0:	First element in partition
	The remaining items consist of blocks of data associated with each element describing the temperature of the element per loadcase.	
Item 1:	Bits 59-54:	Element type
	Bits 53-48:	Number of nodes
	Bits 47-30:	Number of loadcases
	Bits 29-15:	Total number of words
	Bits 14-0:	Zero
Item 2:	Bits 59-30:	Zero
	Bits 29-15:	Number of default temperatures
	Bits 14-0:	Pointer to default temperatures

Item 3 - (number of loadcases + 2)

Bits 59-45:	Internal loadcase
Bits 44-30:	Zero
Bits 29-15:	Number of temperatures
Bits 14-0:	Pointer to loads

<u>Generation</u>: Program THERMEL of the loads processor.

ELEMENT TEMPERATURE CONTROL

File:	LOADRNF	
Index Name:	ELCØNba	
Type:	MIXED	
Dimensions:	N * 1 where N equals number flexible elements	
Auxiliary ID:	Word 1:	LOADRNF
	Word 2:	ELCØNba
	Words 3-10:	Zero
Elements:	Pointers to element temperature matrices. Word i contains the following data for the ith element.	
	Bits 59-31:	Zero
	Bits 30-15:	Row pointer
	Bits 14-0:	Block number
Generation:	Program THERMEL of the loads processor.	

COMPOSITE ELEMENT INITIAL STRESS MATRIX

File:	LOADRNF	
Index Name:	IB001ba, IB002ba, ..., IB999ba	
Type:	REAL	
Dimensions:	M*1 where M ≤ buffer size (default 3000)	
Auxiliary ID:	Word 1:	LOADRNF
	Word 2:	The matrix index name
	Word 3:	Number of loadcases
	Words 4-10:	Zero

Elements: The stresses for one or more elements are fully contained in one partition and stored as follows:

(Element i)
Stress 1 for loadcase 1
Stress 2 for loadcase 1
:
Stress k for loadcase 1
Stress 1 for loadcase 2
:
Stress k for loadcase n

Where k is the number of stresses for the i-th element, and n is the number of loadcases.

Generation: Program THERMU2 of the loads processor.

COMPOSITE ELEMENT
INITIAL STRESS CONTROL MATRIX

File:	LOADRNF	
Index Name:	IBC01ba	
Type:	MIXED	
Dimensions:	N*1 where N = (Number of elements + 1)/2	
Auxiliary ID:	Word 1:	LOADRNF
	Word 2:	IBC01ba
	Word 3:	Number of loadcases
	Words 4-10:	Zero

Elements: Item i contains information about internal elements i and N+i.

Item i:

- Bits 59-45: BLK element i
- Bits 44-30: PTR element i
- Bits 29-15: BLK element N+i
- Bits 14-0: PTR element N+i

Where:

BLK = Partition number of the initial stress matrix containing the stresses for the element

PTR = Pointer to the first row of stress data.

If all 30 bits are zero, no initial stresses exist for the element.

Generation: Program THERMU2 of the loads processor.

INITIAL STRESS MATRIX

File:	LOADRNF
Index Name:	IS001ba, IS002ba, ..., IS999ba
Type:	REAL
Dimensions:	M*1 where M $\leq$ buffer size (default 3000)
Auxiliary ID:	Word 1: LOADRNF Word 2: The matrix index name Word 3: Number of loadcases Words 4-10: Zero

Elements: The stresses for one or more elements are fully contained in one partition and stored as follows:

```
(Element i)     Stress 1 for loadcase 1
                Stress 2 for loadcase 1
                           :
                Stress k for loadcase 1
                Stress 1 for loadcase 2
                           :
                Stress k for loadcase n
```

Where k is the number of stresses for the i-th element, and n is the number of loadcases.

Generation: Programs THERMU, THERMU2 and THERMV of the loads processor.

INITIAL STRESS CONTROL MATRIX

File:	LOADRNF	
Index Name:	ISC01ba	
Type:	MIXED	
Dimensions:	N*1 where N = (Number of elements +1)/2	
Auxiliary ID:	Word 1:	LOADRNF
	Word 2:	ISC01ba
	Word 3:	Number of loadcases
	Words 4-10:	Zero

Elements: Item i contains information about internal elements i and N+i.

Item i:	Bits 59-45:	BLK element i
	Bits 44-30:	PTR element i
	Bits 29-15:	BLK element N+i
	Bits 14-0:	PTR element N+i

Where:

BLK = Partition number of the initial stress matrix containing the stresses for the element

PTR = Pointer to the first row of stress data.

If all 30 bits are zero, no initial stresses exist for the element.

Generation: Programs THERMU, THERMU2, and THERMV of the loads processor.

NODAL LOADS MATRIX

File:	LOADRNF	
Index Name:	LA001ba, LA002ba, ..., LA999ba	
Type:	MIXED	
Dimensions:	N*1 where N equals the block size (default 3000)	
Auxiliary ID:	Word 1:	LOADRNF
	Word 2:	The matrix index name
	Words 3-10:	Zero
Elements:	The first word in each block consists of a keyword for merge: 4LLOAD OR 10000B The remaining elements consist of word pairs defining all nodal loads to be merged.	
Item i:	Bits 59-48:	Internal loadcase number
	Bits 47-36:	Internal node number
	Bits 35-30:	Freedom number
	Bits 29-0:	Zero
Item i+1:	Value of load	
Generation:	Program MUTHALD of the loads processor.	

LOADS FREEDOM ACTIVITY VECTOR

File: LOADRNF

Index Name: LFAV0ba

Type: MIXED

Dimensions: ((N+3)/4)*1 where N is the number of nodes.

Auxiliary ID:

Word 1:	DATARNF
Word 2:	LFAV0ba
Words 3-10:	Zero

Elements: Item j consists of 4 packed 15 bit integers. The 15 bits are associated left to right with the fifteen degrees of freedom at that node. A "0" bit indicates no load for the corresponding freedom. A "1" bit indicates a load at that freedom.

Bits 59-45:	Node 4j-3
Bits 44-30:	Node 4j-2
Bits 29-15:	Node 4j-1
Bits 14-0:	Node 4j

Generation: Program FIN of the loads processor.

APPLIED LOADS RESULTANT MATRIX

File: LOADRNF

Index Name: RSULTba

Type: REAL

Dimensions: N*6 where N equals the number of loadcases

Auxiliary ID:

Word 1:	LOADRNF
Word 2:	RSULTba
Words 3-10:	Zero

Elements: Row i contains information about the i-th loadcase.

Item 1:	Summation of Fx
Item 2:	Summation of Fy
Item 3:	Summation of Fz
Item 4:	Summation of Mx
Item 5:	Summation of My
Item 6:	Summation of Mz

Generation: Program MUTHALD of the loads processor.

AERODYNAMIC CONTROL MATRIX

File:	MACHRNF	
Index Name:	ACMij	
Type:	MIXED	
Dimensions:	1*(8 + number of Mach numbers + number of K-values)	
Auxiliary ID:	Word 1:	MACHRNF
	Word 2:	ACMij
	Word 3:	Zero
	Word 4:	Reference length for K values
	Word 5:	Mach number
	Word 6:	Semispan
	Word 7:	Integration tolerance
	Word 8:	Case number
	Word 9:	Condition number
	Word 10:	Zero

Elements: The elements of this matrix are as follows:

Item 1:	Bits 59-30:	Number of constants
	Bits 29-0:	Location of the first constant
Item 2:	Bits 59-30:	Number of K-values (NKVAL)
	Bits 29-0:	Location of the first K-value
Item 3:	Bits 59-30:	Number of Mach numbers (NMACH)
	Bits 29-0:	Location of the first Mach number
Item 4:	Bits 59-30:	Number of array sizes
	Bits 29-0:	Location of the first array size
Item 5:	Bits 59-30:	Number of zero filled words
	Bits 29-0:	Location of the last element
Item 6:	Reference length for K-values	
Item 7:	Semispan of planform first surface	

Item 8-(7+NKVAL):

Array of K values

Item (8+NKVAL)-(7+NKVAL+NMACH):

Array of Mach numbers

Item 8+NKVAL+NMACH:

Number of modes used

Item 9+NKVAL+NMACH:

Zero

Generation: Program MODES of the machbox processor.

AERODYNAMIC INFLUENCE COEFFICIENT NAMES MATRIX

File: MACHRNF

Index Name: ACNijkl

Type: MIXED

Dimensions: 2*(NVPAIC+1+N) where NVPAIC is the number of spatial velocity potential AIC arrays calculated and N=1 if subdivision is used N=0 otherwise.

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	ACNnijkl
Word 3:	K value
Word 4:	Reference length for K values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: The first item of row 1 contains the number of velocity potential AIC matrices required for the given conditions.

Items 2 through n of row 1 give the AIC index entry number of the required matrices. Row 2 item 1 is 0. All other items of row 2 contain the size of the AIC matrix indicated by the corresponding items of row 1.

Generation: Program VICMAIN of the machbox processor.

VELOCITY POTENTIAL AERODYNAMIC INFLUENCE COEFFICIENT MATRIX

File: MACHRNF

Index Name: AICCeee

Dimensions: 1*number of unique sending-receiving box interactions for the receiving boxes in a plane x unit box widths above the plane of the sending surface. The box centers of the plane are offset y unit box widths for the box centers of the Mach box grid system.

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	AICCeee
Word 3:	K-value
Word 4:	Reference length for K-values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Maximum block size of the un-compressed matrix.
Word 9:	Offset distance in box width units
Word 10:	Vertical separation in box width units

Elements: This matrix contains the velocity potential AIC array as described for matrix AICPeee when the sending suface boxes do not lie in the plane of the receiving box. The upwash and sidewash AIC array must be calculated for this situation.

Generation: Program VICMAIN of the machbox processor.

AERODYNAMIC INFLUENCE COEFFICIENT INDEX MATRIX

File:	MACHRNF
Index Name:	AICINDX
Type:	MIXED
Dimensions:	NAIC*6 where NAIC - the number of entries in the AIC Table of Contents array
Auxiliary ID:	Word 1: MACHRNF Word 2: AICINDX Words 3-10: Zero filled

Elements: This matrix contains the Table of Contents for all AIC matrices written on MACHRNF. Each row corresponds to a unique set of AIC matrices and the row number determines the last three characters (eee) of the index names. For row i, the AIC set may consist of the following combinations of matrices:

a) one planar AIC matrix, AICC00i

b) three spatial AIC matrices and a pointer matrix

AICC00i
AICW00i
AICV00i
AICM00i

c) one planar, three spatial, and one map matrix

AICP00i
AICC00i
AICW00i
AICV00i
AICM00i

Each row contains the following data for the corresponding set of AIC matrices:

Item 1: Mach number

Item 2: K-value

Item 3: Integration tolerance

Item 4: Size

Item 5: Horizontal offset

Item 6: Vertical separation

Generation: Program VICMAIN of the machbox processor.

AERODYNAMIC INFLUENCE COEFFICIENT POINTER MATRIX

File: MACHRNF

Index Name: AICMeee

Type: MIXED

Dimensions: 2*(number of subdivided rows of the planform)

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	AICMeee
Word 3:	K-value
Word 4:	Reference length for K values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerances
Word 8:	Maximum block size of uncompressed AIC matrix
Word 9:	Offset distance in box width units
Word 10:	Vertical separation in box width units

Elements: The elements of this matrix are pointers describing which elements of the spatial AIC matrices, AICCeee, AICWeee, and AICVeee, have been calculated. This matrix must be present to use spatial AIC's. The j-th element of the first row indicates the first sending box on the (j-1)th row. (Rows are measured forward from the row of the receiving box. Boxes are counted starting with the box on the left forward Mach cone.) The j-th element of the second row indicates the last sending box on the (j-1)th row for which a coefficient has been calculated.

Generation: Program VICMAIN of the machbox processor.

PLANAR AERODYNAMIC INFLUENCE COEFFICIENT MATRIX

File:	MACHRNF
Index Name:	AICPeee
Type:	REAL
Dimensions:	1*(number of unique sending-receiving box interactions in the planform plane)

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	AICPeee
Word 3:	K value
Word 4:	Reference length for K values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Maximum block size of the uncompressed matrix
Word 9:	Zero
Word 10:	Zero

Elements: This matrix contains the velocity potential aerodynamic influence coefficients for a planar planform. An element of the array may be interpreted as the velocity potential induced at the center of a receiving box due to a unit upwash uniformly distributed over a full or partial sending box. A complete AIC matrix contains a coefficient for every combination of sending box and receiving box.

The size of each AIC matrix is determined by the number of boxes on the sending surface which influence the receiving box. Receiving boxes at different spanwise locations on the receiving surface will, in general, require different AIC matrices. However, receiving boxes which lie on the same chord of the receiving surface use the same AIC's, and consequently, an AIC matrix that is large enough to satisfy the requirements of the aftmost box on that surface can be used for all boxes on that chord. Note that "surface" includes any diaphragm areas needed in the solution of the problem. When the receiving surface lies in the

plane of the sending surface, one velocity potential AIC matrix may be used for all chords. The upwash AIC matrices and the sidewash AIC matrices are not needed for this situation.

Generation: Program VICMAIN of the machbox processor.

SIDEWASH AERODYNAMIC INFLUENCE COEFFICIENT MATRIX

File:	MACHRNF
Index Name:	AICVeee
Type:	REAL
Dimensions:	1*number of unique sending-receiving box interactions for the receiving boxes in a plane x unit box widths above the plane of the sending surface. The box centers of the plane are offset y unit box widths from the box centers of the Mach box grid system.
Auxiliary ID:	Word 1: MACHRNF Word 2: AICVeee Word 3: K-value Word 4: Reference length for K values Word 5: Mach number Word 6: Semispan value Word 7: AIC integration tolerance Word 8: Maximum block size of the uncompressed matrix Word 9: Offset distance in box width units Word 10: Vertical separation in box width units.
Elements:	The elements of this matrix, the sidewash AIC's, are found by taking the partial derivative of the velocity potential AIC's with respect to the spanwise direction. Size restrictions and format are the same as for the velocity potential AIC's.
Generation:	Program VICMAIN of the machbox processor.

UPWASH AERODYNAMIC INFLUENCE COEFFICIENT MATRIX

File:	MACHRNF
Index Name:	AICWeee
Type:	REAL
Dimensions:	1*number of unique sending-receiving box interations for the receiving boxes in a plane x unit box widths above the plane of the sending surface. The box centers of the plane are offset y unit box widths from the box centers and the Mach box grid system.

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	AICWeee
Word 3:	K-value
Word 4:	Reference length for K values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Maximum block size of the uncompressed matrix
Word 9:	Offset distance in box width units
Word 10:	Vertical separation in box width units.

Elements: The elements of this matrix, the upwash AIC's, are found by taking the partial derivative of the velocity potential AIC's with respect to the vertical direction. Size restrictions and format are the same as for the velocity potential AIC's.

Generation: Program VICMAIN of the machbox processor.

BOX LIFT MATRIX

File: MACHRNF

Index Name: BLnijkl

Type: REAL

Dimensions: 1*NBX where NBX is the number of planform boxes

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	BLnijkl
Word 3:	K-value
Word 4:	Reference length for K values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: This matrix contains box lifts. The items of this matrix are associated with boxes of the planform by the MPTijkl matrix.

Generation: Program FORCES of the machbox processor.

NONCOPLANAR TAIL BOX CODE MATRIX

File:	MACHRNF
Index Name:	BØXijkT
Type:	MIXED
Dimensions:	(N/20)*M where N equals the total number of chords and M equals the total number of rows of boxes on the noncoplanar tail.
Auxiliary ID:	Word 1: MACHRNF Word 2: BØXijkT Word 3: Zero Word 4: Reference length for K values Word 5: Mach number Word 6: Semispan value Word 7: AIC integration tolerance Word 8: Case number Word 9: Condition number Word 10: Zero
Elements:	This matrix contains the compressed box codes for planform boxes, diaphragm boxes and wake boxes of a noncoplanar tail.
Generation:	Program GEOMBX of the machbox processor.

WING BOX CODE MATRIX

File: MACHRNF

Index Name: BØXijkW

Type: MIXED

Dimensions: (N/20)*M where N equals the total number of chords and M equals the total number of rows of boxes on the wing or coplaner tail.

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	BØXijkW
Word 3:	Zero
Word 4:	Reference length for K values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: This matrix contains the compressed box codes for planform boxes, diaphragm boxes and wake boxes of a wing or coplanar wing and tail.

Generation: Program GEOMBX of the machbox processor.

SECTIONAL MOMENT MATRIX

File: MACHRNF

Index Name: CMnijkl

Type: REAL

Dimensions: 1*NCDS where NCDS is the total number of chords on surface 1 and surface 2.

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	CMnijkl
Word 3:	K-value
Word 4:	Reference length for K values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: This matrix contains the sectional moment for each chord of the planform.

Generation: Program FORCES of the machbox processor.

NORMAL WASH POINTER MATRIX

File: MACHRNF

Index Name DWPijkl

Type: MIXED

Dimensions: 2*NROWS where NROWS is the number of planform, diaphragm and wake rows for which subdivided normal wash is calculated.

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	DWPijkl
Word 3:	K-value
Word 4:	Reference length for K values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: This matrix contains the normal wash pointer array. The format is same as for the MPTijk matrix. Boxes of the planform diaphragm, and wake region are referenced by this matrix.

Generation: Program NWVPMBX of the machbox processor.

MACHBOX EXECUTION PARAMETER MATRIX

File:	MACHRNF	
Index Name:	EXPij	
Type:	MIXED	
Dimensions:	1 x 1304	
Auxiliary ID:	Word 1:	MACHRNF
	Word 2:	EXPij
	Word 3:	Zero
	Word 4:	Reference length for K-values
	Word 5:	First Mach number of the execution list
	Word 6:	Semispan maximum spanwise dimension of surface 1
	Word 7:	AIC integration tolerance
	Word 8:	Case number
	Word 9:	Condition number
	Word 10:	Zero

Elements: This matrix contains all the planform geometry data and the execution parameters used by the technical module of MACHBOX.

Labelled common MATRNAM

Item 1-10:	TITLE(ID)	-	10 words containing data case title in Hollerith format

Labelled common GEOMTY

Item 11:	COPLAN	-	logical indication for coplanar surfaces .T. surfaces are coplanar .F. two surfaces do not have the same dihedral angle or only one surface is defined
Item 12:	NSUBDV	-	the number of subdivided rows (columns) per box

Item 13:	XSUBDV	-	Float (NSUBDV)
Item 14:	NSUBD2	-	NSUBDV/2
Item 15:	NSUBCN	-	NSUBD2 + 1 center y location of first chord
Item 16:	NSURF	-	number of surfaces
Item 17:	B1	-	box length
Item 18:	B1BETA	-	box width
Item 19:	B1S	-	subdivided box length=B1/XSUBDV
Item 20:	B1BTAS	-	subdivided box width=B1BETA/XSUBDV
Item 21:	WLAX	-	global x coordinate of the wing local axis location
Item 22:	WLAZ	-	global z coordinate of the wing local axis location
Item 23:	PSIW	-	dihedral angle of the first surface, input in degrees but converted to radians
Item 24:	MXBW	-	number of rows to the aftmost portion of the first surface
Item 25:	MXBBW	-	number of rows to the first surface aftmost diaphragm box
Item 26:	MYBW	-	number of chords on the first surface (NCHRDS)
Item 27:	MYBBW	-	number of first surface chords including tip diphragm
Item 28:	MXBSW	-	subdivided MXBW count
Item 29:	MYBSW	-	subdivided MYBW count
Item 30:	MYBBSW	-	subdivided MYBBW count

Item 31:	IXBW	-	subdivided grid x-location of the first unsubdivided box center of the first surface
Item 32:	XCENTR	-	x-location of the center of the first box on the first surface

Labelled common GEOM2

Item 33:	TLAX	-	global x coordinate of the second surface local axis location
Item 34:	TLAZ	-	global z coordinate of the second surface local axis location
Item 35:	PSIT	-	dihedral angle of the second surface input in degrees but converted to radians
Item 36:	MXBT	-	number of rows to the aftmost portion of the second surface
Item 37:	MYBT	-	number of chords on the second surface
Item 38:	MYBBT	-	number of second surface chords including tip diaphragm
Item 39:	MXBST	-	subdivided MXBT count
Item 40:	MXBST	-	subdivided MYBT count
Item 41:	MYBBST	-	subdivided MYBBT count
Item 42:	IXBT	-	subdivided grid x location of the first unsubdivided box center of the second surface
Item 43:	IXBST	-	subdivided grid x location of the first subdivided box of the second surface
Item 44:	CAPL	-	non-dimensionalized vertical distance between centerlines of the first and second surfaces

Labelled common PLANXY

Item 45:	NWLE	-	number of first surface leading edge definition points
Item 46:	NWTE	-	number of first surface trailing edge definition points
Item 47:	NTLE	-	number of second surface leading edge definition points
Item 48:	NTTE	-	number of second surface trailing edge definition points
Item 49-58:	XWLE	-	x locations of the first surface leading edge definition points
Item 59-68:	YWLE	-	y locations of the first surface leading edge definition points
Item 69-78:	XWTE	-	x locations of the first surface trailing edge definition points
Item 79-88:	YWTE	-	y locations of the first surface trailing edge definition points
Item 89-98:	XTLE	-	x locations of the second surface leading edge definition points
Item 99-108:	YTLE	-	y locations of the second surface leading edge definition points
Item 109-118:	XTTE	-	x locations of the second surface trailing edge definition points
Item 119-128:	YTTE	-	y locations of the second surface trailing edge definition points

Labelled common ARRAYS

Item 129:	KBXCDW	-	reserved for future use

Item 130:	LBXCDW	-	row dimension of the wing box code array
Item 131:	LBOXC	-	column dimension of the wing box code array
Item 132:	KBXCDT	-	reserved for future use
Item 133:	LBXCDT	-	row dimension of the tail box code array
Item 134:	KJALPH	-	reserved for future use
Item 135:	LJALPH	-	length of the IJALPH array
Item 136:	KALPHA	-	reserved for future use
Item 137:	KKERNL	-	reserved for future use
Item 138:	LKERNL	-	length of the SKERNL array
Item 139:	KPNTRM	-	reserved for future use
Item 140:	LPNTRM	-	length of the planform pointer array
Item 141:	KDEFSL	-	reserved for future use
Item 142:	KELPHI	-	reserved for future use
Item 143:	LMODES	-	length of the complex velocity potential array
Item 144:	KPNTSP	-	reserved for future use
Item 145:	LPNTSP	-	column dimension of the subdivided normal wash points array
Item 146:	KSDW	-	reserved for future use
Item 147:	LSDW	-	column dimension of the subdivided normal wash array
Item 148:	KPNTDW	-	reserved for future use
Item 149:	LPNTDW	-	column dimension of the normal wash pointer array

Item 150:	KDW	-	reserved for future use
Item 151:	LDW	-	length of the upper surface and lower surface normal wash arrays
Item 152:	KTVP	-	reserved for future use
Item 153:	LTVP	-	length of the leading and trailing edge pointer arrays and of the trailing edge velocity potential array
	Labelled common SAMPLW		
Item 154:	ISMPLW	-	number of chords specified for wash sampling
Item 155-164:			
	ICHORD(10)	-	chord number for sampling
Item 165-174:			
	IBOXF(10)	-	first box on chord to be sampled
Item 175-184:			
	IBOXL(10)	-	last box on chord to be sampled
Item 185-194:			
	ZLOC(10)	-	Z-location of the sampling chord, transformed internally to correspond to wing coordinates
	Labelled common MODES		
Item 195:	NAME1	-	the name of the interpolation coefficient array to be used with surface 1
Item 196:	NAME2	-	same as above for surface 2
Item 197:	RBX		
Item 198:	RBY	-	global coordinates of the Rigid Body Reference Point

Item 199:	RBZ		
Item 200-211:			
	RBDEL(2,6)	-	array of Rigid Body keywords and displacement magnitudes
Item 212:	FMOD1	-	the first mode shape of the first surface interpolation information array to be used
Item 213:	FMOD2	-	the first mode shape of the second surface interpolation information array to be used
Item 214:	LMOD1	-	the last mode shape of the first surface interpolation information array to be used
Item 215:	LMOD2	-	the last mode shape of the second surface interpolation information array to be used
Item 216:	NMODES:	-	the total number of modes from the first surface interpolation information array to be used
Item 217:	NMODE2	-	the total number of modes from the second surface interpolation information array to be used. NMODES must equal NMODE2
	Labelled common BOX		
Item 218:	NCHRDS	-	the number of chords to be used in the analysis
Item 219:	XEDGE	-	the local coordinate x of the leading edge of a planform box
	Labelled common TSLOPE		
Item 220:	NTSS1	-	number of thickness slopes input for surface 1
Item 221:	NTSS2	-	number of thickness slopes input for surface 2

Item 222:	TSMN1	-	Mach number for which surface 1 thickness slopes are to be used
Item 223:	TSMN2	-	Mach number for which surface 2 thickness slopes are to be used

Items 224-1223:

	TS(500,2)	-	Array of thickness slopes

Labelled common EXEC

Item 1224:	DIHW	-	logical indicator for surface interaction calculations
			.T. Include dihedral angle of surface 1 in the calculation of the influence of the first surface itself
			.F. Use dihedral angle only in the calculation of interaction between surfaces
Item 1225:	DIHT	-	logical indicator for surface interaction calculations
			.T. Include dihedral angle of surface 2 in the calculation of the influence of the second surface itself
			.F. Use dihedral angle only in the calculation of interaction between surfaces
Item 1226:	SMOOTH	-	logical indication for application of surface least squares polynomial fitting to velocity potentials before calculation of generalized forces
			.T. Velocity potentials are to be fitted by a surface fit
			.F. Velocity potentials are not to be fitted by a surface fit

Item 1227: CRDFIT - logical indication for application of chordwise least squares polynomial fitting to velocity potentials before calculation of generalized forces

.T. Velocity potentials are to be fitted by a chordwise fit

.F. Velocity potentials are not to be fitted by a chordwise fit

Item 1228: EXAIC - logical indication for application of fine integration tolerances in the calculation of AIC's

.T. tolerance is .0001

.F. tolerance is .01

Item 1229: SUBDV - logical indicator for application of subdivision technique for calculation of normal washes

.T. technique will be applied

.F. technique will not be applied

Item 1230: PLYWOOD - logical indicator for use of full box areas in calculation instead of fractional areas

.T. full box areas are used everywhere

.F. fractional areas are used for boxes that are cut by planform boundary

Item 1231: SYM - indicator for symmetry option to be applied to first surface

1 symmetric analysis

0 no left hand surface contributions are to be calculated (nonsymmetric analysis)

-1 antisymmetric analysis

Item 1232: NDEG - the degree of the polynomial fit to be applied

Item 1233: SYMT - indicator for symmetry option to be applied to second surface

1 symmetric analysis

0 no left hand surface contributions are to be calculated (nonsymmetric analysis)

-1 antisymmetric analysis

Labelled common MACH common /MACH/.

Item 1234: IMACH - index of Mach number currently being used

Item 1235: NMACHS - number of Mach numbers to be used

Items 1236-1255:

PMACH(20) - List of Mach numbers to be used

Item 1256: XMACH - the Mach number currently being used

Labelled common KVAL

Item 1257: IKVAL - index of K value currently being used

Item 1258: NKVALS - number of K values to be used

Items 1259-1278:

XKVAL(20)	-	List of K values after conversion of reference length

Items 1279-1298:

XKS(20)	-	List of input K values before conversion

Item 1299: XKREF - reference length on which input K values are to be based

Labelled common LEVEL

Items 1300-1304:

LEVELS - Logical indicators specifying that selected sets of data are to be written on MACHRNF

.T. selected information will be written on MACHRNF

.F. only box codes and generalized forces will be written on MACHRNF

Generation: Program DATAPP of the machbox processor.

REAL GENERALIZED AERODYNAMIC COEFFICIENT MATRIX

File:	MACHRNF
Index Name:	GACijkl
Type:	REAL
Dimensions:	NMODES * NMODES where NMODES is the number of modes used to generate the general air forces.

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	GACijkl
Word 3:	K-value
Word 4:	Reference length for K-values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: The elements of this matrix are the real parts of the generalized aerodynamic coefficients as defined by the Advisory Group for Aerodynamic Research & Development (AGARD).

Generation: Program FORCES of the machbox processor.

IMAGINARY GENERALIZED AERODYNAMIC COEFFICIENT MATRIX

File: MACHRNF

Index Name: GCIijkl

Type: REAL

Dimensions: NMODES * NMODES where NMODES is the number of modes used to generate the general air forces.

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	GCIijkl
Word 3:	K-value
Word 4:	Reference length for K-values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: The elements of this matrix are the imaginary parts of the generalized aerodynamic coefficients as defined by the Advisory Group for Aerodynamic Research & Development (AGARD).

Generation: Program FORCES of the machbox processor.

GENERALIZED FORCE MATRIX

File:	MACHRNF
Index Name:	GF0ijkl
Type:	REAL
Dimensions:	NMODES * NMODES where NMODES is the number of modes used to generate the general air forces.
Auxiliary ID:	Word 1: MACHRNF Word 2: GF0ijkl Word 3: K-value Word 4: Reference length for K-values Word 5: Mach number Word 6: Semispan value Word 7: AIC integration tolerance Word 8: Case number Word 9: Condition number Word 10: Zero
Elements:	This array contains the generalized air forces generated by MACHBOX. This array will be present for every combination of Mach number and K value specified on the execution card.
Generation:	Program FORCES of the machbox processor.

MODE SHAPE PRINTING POINTER MATRIX

File: MACHFNF

Index Name: ISPijk

Type: MIXED

Dimensions: 1 x 400

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	ISPijk
Word 3:	Zero
Word 4:	Reference length for K-values
Word 5:	Mach number
Word 6:	Semispan
Word 7:	Integration tolerance for AIC generation
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements:

Item 1-100:	The row number of the first planform box on each chord
Item 101-200:	The number of boxes on each chord
Item 201-300:	The column number of the first planform box in each row of boxes
Item 301-400:	The number of planform boxes in each row

Elements corresponding to boxes on the second surface are located immediately after the last elements corresponding to boxes on the first surface.

Generation: Program MODES of the machbox processor.

WING OR WING/TAIL LOWER SURFACE NORMAL WASH MATRIX

File: MACHRNF

Index Name: LNnijkl

Type: REAL

Dimensions: 1*NBX where NBX is the number of boxes on the wing plus the number of boxes in the diaphragm area of the wing plus the number of boxes in the wake area of the wing.

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	LNnijkl
Word 3:	K-value
Word 4:	Reference length for K-values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: This matrix contains the lower surface normal wash values for the wing.

Elements of this matrix are associated with boxes of the planform, wake, or diaphragm regions by the DWPijkl matrix.

Generation: Program NWVPMBX of the machbox processor.

NON COPLANAR TAIL LOWER SURFACE NORMAL WASH MATRIX

File:	MACHRNF
Index Name:	LTnijkl
Type:	REAL
Dimensions:	1*NBX where NBX is the number of boxes on the non-coplanar tail plus the number of boxes in the diaphragm area of the tail plus the number of boxes in the wake area of the tail.
Auxiliary ID:	Word 1: MACHRNF Word 2: LNnijkl Word 3: K-value Word 4: Reference length for K-values Word 5: Mach number Word 6: Semispan value Word 7: AIC integration tolerance Word 8: Case number Word 9: Condition number Word 10: Zero
Elements:	This matrix contains the lower surface normal wash values for the tail. Elements of this matrix are associated with boxes of the planform, wake, or diaphragm regions by the DWPijkl matrix.
Generation:	Program NWVPMBX of the machbox processor.

MODE SHAPES MATRIX

File: MACHRNF

Index Name: MØnijkl

Type: REAL

Dimensions: 2*(number of planform boxes)

Auxiliary ID:

	Word 1:	MACHRNF
	Word 2:	MØnijkl
	Word 3:	Zero
	Word 4:	Reference length for K-values
	Word 5:	Mach number
	Word 6:	Semispan value
	Word 7:	AIC integration tolerance
	Word 8:	Case number
	Word 9:	Condition number
	Word 10:	Zero

Elements: This matrix contains the slopes and deflections for planform boxes at the box centers. The deflections are contained in row 1. The slopes are contained in row 2.

Generation: Program MODES of the machbox processor.

PLANFORM POINTER MATRIX

File: MACHRNF

Index Name: MPTijk

Type: MIXED

Dimensions: 2*(number of planform rows + 1)

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	MPTijk
Word 3:	Zero
Word 4:	Reference length for K-values
Word 5:	Mach number
Word 6:	Semispan
Word 7:	Integration tolerance for AIC generation
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: This matrix contains a pointer array that associates a box location in a sparsely filled rectangular matrix with a corresponding mode, velocity potential, box lift, or pressure difference coefficient in a single dimensional densely filled matrix.

Item j of row 1 of this matrix gives the sequential count +1 of all boxes, planform or wake regions, that are on or between the first and last planform box of all planform rows forward of the row j.

Item j of row 2 gives the chord number of the first planform box on the j-th planform row.

Elements corresponding to the second surface are found immediately following those for the first surface.

Generation: Program MODES of the machbox processor.

PRESSURE DIFFERENCE COEFFICIENTS MATRIX

File: MACHRNF

Index Name: PCnijkl

Type: REAL

Dimensions: 1*NBX where NBX is the number of boxes on the planform.

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	PCnijkl
Word 3:	K-value
Word 4:	Reference length for K-values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: This matrix contains the pressure difference coefficients. Elements of this matrix are associated with boxes of the planform by the MPTijkl matrix.

Generation: Program FORCES of the machbox processor.

TAIL SUBDIVIDED NORMAL WASH POINTER MATRIX

File:	MACHRNF	
Index Name:	PSTijkl	
Type:	MIXED	
Dimensions:	2*50	
Auxiliary id:	Word 1:	MACHRNF
	Word 2:	PSTijkl
	Word 3:	K-value
	Word 4:	Reference length for K-values
	Word 5:	Mach number
	Word 6:	Semispan
	Word 7:	AIC integration tolerance
	Word 8:	Case number
	Word 9:	Condition number
	Word 10:	Zero
Elements:	This matrix contains end around pointers for the tail subdivided normal wash matrices. The format is similar to the MPTijkl matrix. Boxes of the planform, diaphragm, and wake regions are referenced.	
Generation:	Program NWVPMBX of the machbox processor.	

WING SUBDIVIDED NORMAL WASH POINTER MATRIX

File:	MACHRNF
Index Name:	PSWijkl
Type:	MIXED
Dimensions:	2*50
Auxiliary ID:	Word 1: MACHRNF Word 2: PSWijkl Word 3: K-value Word 4: Reference length for K-values Word 5: Mach number Word 6: Semispan value Word 7: AIC integration tolerance Word 8: Case number Word 9: Condition number Word 10: Zero
Elements:	This matrix contains end around pointers for the wing subdivided normal wash matrices. The format is similar to the MPTijkl matrix. Boxes of the planform, diaphragm, and wake regions are referenced.
Generation:	Program NWVPMBX of the machbox processor.

SMOOTHED REAL GENERALIZED AERODYNAMIC COEFFICIENT MATRIX

File: MACHRNF

Index Name: SACijkl

Type: REAL

Dimensions: NMODES * NMODES where nmodes is the number of modes used to generate the general air forces.

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	SACijkl
Word 3:	K-value
Word 4:	Reference length for K-values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: The elements of this matrix are the real parts of the smoothed generalized aerodynamic coefficients as defined by the Advisory Group for Aerodynamic Research & Development (AGARD).

Generation: Program FORCES of the machbox processor.

SMOOTHED BOX LIFT MATRIX

File:	MACHRNF
Index Name:	SBnikjl
Type:	REAL
Dimensions:	1*NBX where NBX is the number of planform boxes.
Auxiliary ID:	Word 1: MACHRNF Word 2: SBnijkl Word 3: K-value Word 4: Reference length for K-values Word 5: Mach number Word 6: Semispan value Word 7: AIC integration tolerance Word 8: Case number Word 9: Condition number Word 10: Zero
Elements:	This matrix contains smoothed box lifts. Elements of this matrix are associated with boxes of the planform by the MPTijkl matrix.
Generation:	Program FORCES of the machbox processor.

SMOOTHED IMAGINARY GENERALIZED AERODYNAMIC COEFFICIENT MATRIX

File: MACHRNF

Index Name: SCIijkl

Type: REAL

Dimensions: NMODES * NMODES where NMODES is the number of modes used to generate the general air forces.

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	SCIijkl
Word 3:	K-value
Word 4:	Reference length for K-values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: The elements of this matrix are the imaginary parts of the smoothed generalized aerodynamic coefficients as defined by the Advisory Group for Aerodynamic Research & Development (AGARD).

Generation: Program FORCES of the machbox processor.

SMOOTHED GENERALIZED FORCE MATRIX

File: MACHRNF

Index Name: SF0ijkl

Type: REAL

Dimensions: NMODES * NMODES where NMODES is the number of modes used to generate the general air forces.

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	SF0ijkl
Word 3:	K-value
Word 4:	Reference length for K-values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: This matrix contains the smoothed generalized air forces generated by MACHBOX. This matrix will be present for every combination of Mach number and K value specified on the execution card.

Generation: Program FORCES of the machbox processor.

SECTIONAL LIFTS MATRIX

File:	MACHRNF
Index Name:	SLnijkl
Type:	REAL
Dimensions:	1*NCDS where NCDS equals the total number of chords on surface 1 and surface 2.
Auxiliary ID:	Word 1: MACHRNF Word 2: SLnijkl Word 3: K-value Word 4: Reference length for K-values Word 5: Mach number Word 6: Semispan value Word 7: AIC integration tolerance Word 8: Case number Word 9: Condition number Word 10: Zero
Elements:	This matrix contains the total sectional lifts for each chord due to all boxes on that chord.
Generation:	Program FORCES of the machbox processor.

SMOOTHED SECTIONAL MOMENT MATRIX

File:	MACHRNF
Index Name:	SMnijkl
Type:	REAL
Dimensions:	1*NCDS where NCDS is the total number of chords on surface 1 and surface 2.
Auxiliary ID:	Word 1: MACHRNF Word 2: SMnijkl Word 3: K-value Word 4: Reference length for K-values Word 5: Mach number Word 6: Semispan value Word 7: AIC integration tolerance Word 8: Case number Word 9: Condition number Word 10: Zero
Elements:	This matrix contains the smoothed sectional moment for each chord of the planform.
Generation:	Program FORCES of the machbox processor.

SMOOTHED PRESSURE DIFFERENCE COEFFICIENTS MATRIX

File:	MACHRNF
Index_Name:	SPnijkl
Type:	REAL
Dimensions:	1*NBX where NBX is the number of boxes on the planform.

Auxiliary_ID:

Word 1:	MACHRNF
Word 2:	SPnijkl
Word 3:	K-value
Word 4:	Reference length for K-values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: This matrix contains the smoothed pressure difference coefficients.

Elements of this matrix are associated with boxes of the planform by the MPTijkl matrix.

Generation: Program FORCES of the machbox processor.

SMOOTHED SECTIONAL LIFTS MATRIX

File:	MACHRNF
Index Name:	SSnikjl
Type:	REAL
Dimensions:	1*NCDS where NCDS equals the total number of chords on surface 1 and surface 2.

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	SSnijkl
Word 3:	K-value
Word 4:	Reference length for K-values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: This matrix contains the total smoothed sectional lifts for each chord due to all boxes on that chord.

Generation: Program FORCES of the machbox processor.

TAIL SUBDIVIDED NORMAL WASH MATRIX

File:	MACHRNF
Index Name:	STnijkl
Type:	REAL
Dimensions:	2*NSBX where NSBX is the total number of subdivided boxes for planform, diaphragm and wake regions on a non-coplanar tail.
Auxiliary ID:	Word 1: MACHRNF Word 2: STnijkl Word 3: K-value Word 4: Reference length for K-values Word 5: Mach number Word 6: Semispan value Word 7: AIC integration tolerance Word 8: Case number Word 9: Condition number Word 10: Zero
Elements:	This matrix contains the subdivided normal wash array for the tail. Elements of this array are associated with boxes of the subdivided planform, wake, and diaphragm region by the PSTijkl matrix.
Generation:	Program NWVPMBX of the machbox processor.

WING SUBDIVIDED NORMAL WASH MATRIX

File: MACHRNF

Index Name: SUnijkl

Type: REAL

Dimensions: 2*NSBX where NSBX is the total number of subdivided boxes for planform, diaphragm and wake regions for the wing or coplanar wing and tail.

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	SUnijkl
Word 3:	K-value
Word 4:	Reference length for K-values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: This matrix contains the subdivided normal wash array for wing or coplanar wing and tail. Elements of this array are associated with boxes of the subdivided planform, wake, and diaphragm region by the PSWijkl matrix.

Generation: Program NWVPMBX of the machbox processor.

SMOOTHED VELOCITY POTENTIAL MATRIX

File:	MACHRNF	
Index Name:	SVnijkl	
Type:	REAL	
Dimensions:	1*NBX where NBX is the number of boxes.	
Auxiliary ID:	Word 1:	MACHRNF
	Word 2:	SVnijkl
	Word 3:	K-value
	Word 4:	Reference length for K-values
	Word 5:	Mach number
	Word 6:	Semispan value
	Word 7:	AIC integration tolerance
	Word 8:	Case number
	Word 9:	Condition number
	Word 10:	Zero
Elements:	This matrix contains the smoothed velocity potentials. Elements of this matrix are associated with boxes of the planform region by the MPTijkl matrix.	
Generation:	Program SMOOTH or CHORDF of the machbox processor.	

WING UPPER SURFACE NORMAL WASH MATRIX

File: MACHRNF

Index Name: UNnijkl

Type: REAL

Dimensions: 1*NBX where NBX is the number of boxes on the wing plus the number of boxes in the diaphragm area of the wing plus the number of boxes in the wake area of the wing.

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	UNnijkl
Word 3:	K-value
Word 4:	Reference length for K-values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: This matrix contains the upper surface normal wash values for the wing.

Elements of this matrix are associated with boxes of the planform, wake, or diaphragm regions by the DWPijkl matrix.

Generation: Program NWVPMBX of the machbox processor.

TAIL UPPER SURFACE NORMAL WASH MATRIX

File:	MACHRNF
Index Name:	UTnijkl
Type:	REAL
Dimensions:	1*NBX where NBX is the number of boxes on the non-coplanar tail plus the number of boxes in the diaphragm area of the tail plus the number of boxes in the wake area of the tail.
Auxiliary ID:	Word 1: MACHRNF Word 2: UNnijkl Word 3: K-value Word 4: Reference length for K-values Word 5: Mach number Word 6: Semispan value Word 7: AIC integration tolerance Word 8: Case number Word 9: Condition number Word 10: Zero
Elements:	This matrix contains the upper surface normal wash values for the tail. Elements of this matrix are associated with boxes of the planform, wake, or diaphragm regions by the DWPijkl matrix.
Generation:	Program NWVPMBX of the machbox processor.

VELOCITY POTENTIAL MATRIX

File: MACHRNF

Index Name: VPnijkl

Type: REAL

Dimensions: 1*NBX where NBX is the number of boxes.

Auxiliary ID:

Word 1:	MACHRNF
Word 2:	VPnijkl
Word 3:	K-value
Word 4:	Reference length for K-values
Word 5:	Mach number
Word 6:	Semispan value
Word 7:	AIC integration tolerance
Word 8:	Case number
Word 9:	Condition number
Word 10:	Zero

Elements: This matrix contains the smoothed velocity potentials. Elements of this matrix are associated with boxes of the planform region by the MPTijkl matrix.

Generation: Program NWVPMBX of the machbox processor.

OFF-PLANFORM WASH SAMPLE MATRIX

File:	MACHRNF	
Index Name:	WSnijkl	
Type:	REAL	
Dimensions:	1*1200	
Auxiliary ID:	Word 1:	MACHRNF
	Word 2:	WSnijkl
	Word 3:	K-value
	Word 4:	Reference length for K-values
	Word 5:	Mach number
	Word 6:	Semispan value
	Word 7:	AIC integration tolerance
	Word 8:	case number
	Word 9:	Condition number
	Word 10:	Zero

Elements: This matrix contains three types of off-planform wash sampling values. The values are complex decimal numbers. The real part of each value is in row 1. The imaginary part is in row 2. The first 400 values are for upwash. Values 401-800 are for side wash. The last 400 values are for longitudinal wash. For each type of sample there are 40 values for each of 10 sample chords. The values correspond to the boxes on the specified chord of the planform. Sample washes will be present only for the boxes and chords specified.

Generation: Program NWVPMBX of the machbox processor.

CONCENTRATED MASS DATA MATRIX

File Name:	MASSRNF
Index Name:	Cg0001a, Cg0002a, ..., Cg9999a
Type:	MIXED
Dimensions:	LN * 1, where LN ≤ 5000. The dimensions are reduced such that the mass matrix for the last concentrated mass in the block is wholly contained in one block.

Auxiliary ID:

Word 1:	MASSRNF
Word 2:	The matrix index name.
Word 3:	Number of masses in this data set
Word 4:	Internal number of the first mass in this block
Word 5:	Internal number of the last mass in this block
Words 6-10:	Zero

Elements:

Item 1: Identification word containing 4 packed integers.

Bits 59-36:	MASS (display code)
Bits 35-30:	Zero
Bits 29-15:	Internal number of the first mass in the block
Bits 14- 0:	Internal number of the last mass in the block

Item 2-LN: Concentrated mass matrix data stored as follows:

Word 1 is an ID word containing 4 packed integers

Bits 59-45:	Internal concentrated mass number
Bits 44-30:	Zero
Bits 29-15:	NF, number of kinematic freedoms
Bits 14-0:	Zero

Words 2-(NF+1) contain runcodes, each consisting of 2 packed integers

Bits 59-30:	Internal node number
Bits 29-0:	Freedom number

Words (NF+2)-(NF*(NF+3)/2+2) contain the matrix terms, stored rowwise, lower triangular, full.

Generation: Program LUMPGEN of the mass processor.

PASSENGER, CARGO, AND FUEL VECTORS

File:	MASSRNF
Index Name:	CVECppa FVECffa PVECppa
Type:	MIXED
Dimensions:	2*N where N is variable depending on the number of passengers, cargo hold loading commands, and fuel usage commands.
Auxiliary ID:	Word 1: MASSRNF Word 2: The matrix index name Words 3-10: Zero
Elements:	Column i contains the following data for the ith point on the vector.
Item 1:	Weight
Item 2:	X-cg
Generation:	Program PAYVEC of the mass processor.

FUEL TABLES

File: MASSRNF

Index Name: FTtt01a, FTtt02a, ..., FTtt99a

Type: REAL

Dimensions: 11*N where N is the sum of the fuel levels of the tanks. (N≤ 300)

Auxiliary ID:

Word 1:	MASSRNF
Word 2:	The matrix index name.
Words 3-10:	Zero

Elements: Each column contains the following data for one fuel level.

- Item 1: Fuel height
- Item 2: Weight of fuel in the tank
- Item 3-5: X, Y, and Z coordinates of the center of gravity
- Item 6-11: Ixx, Iyy, Izz, Ixy, Ixz, Iyz

Generation: Program FUELTAB of the mass processor.

FUEL TABLE INDEX MATRIX

File: MASSRNF

Index Name: FTINDXa

Type: MIXED

Dimensions: (N+1)*1 where N is the number of defined fuel tanks.

Auxiliary ID:

Word 1:	MASSRNF
Word 2:	FTINDXa
Words 3-10:	Zero

Elements:

Item 1: Number of fuel tanks

Item 2-(N+1):

Bits 59-45:	Tank identification
Bits 44-42:	Reserved
Bits 41-36:	Number of fuel levels
Bits 35-18:	Reserved
Bits 17-9:	Fuel table block number for this tank
Bits 8-0:	Pointer to the fuel table column for this tank.

Generation: Program FUELTAB of the mass processor.

ELEMENT GEOMETRY DATA

File:	MASSRNF
Index Names:	GK0001a, GK0002a, ..., GK9999a (Stiffness elements) GM0001a, GM0002a, ..., GM9999a (Mass elements) GFff01a, GFff02a, ..., GFff99a (Fuel elements) GPpp01a, GPpp02a, ..., GPpp99a (Payload elements)
Type:	MIXED
Dimensions:	M * 1 where M is the matrix block size (currently 4000).

Auxiliary ID:

Word 1:	MASSRNF
Word 2:	The matrix index name
Word 3:	Number of elements in this block
Word 4:	Internal number of the first element in this block
Word 5:	Internal number of the last element in this block
Word 6:	Number of elements in this block excluding spars and covers.
Word 7:	Number of spars in this block
Word 8:	Number of covers in this block
Words 9-10:	Zero

Elements: The property and nodal coordinate data for the ith element is stored sequentially (PROP1, ..., PROPm, X1, Y1, Z1, ..., Xn, Yn, Zn ...) beginning at the pointer word for that element. (The pointers are stored in the IDX matrices). The words preceeding the pointer word contain the element weight factors.

The table below shows the element properties, the number of words required for the node coordinates, and the weight factors for each element type. (The element type is not stored)

TYPE	PROPERTIES	WORDS	FACTOR
RØD SRØD	A1 A2 Density	6	Pointer-1
BEAM	Density A1 J1 IY1 IZ1 A2 J2 IY2 IZ2	3*N	Pointer-1
SPAR	A1(u) A1(l) A2(u) A2(l) Density(u) Density(l) Density(w) t(w) ØFF1 ØFF2	12	Pointer-1(Cap-u) Pointer-2(Cap-l) Pointer-3(Web)
CØVER CCØVER	Density(u) t(u) 1 Density(l) t(l) 1	6*N	Pointer-1(upper) Pointer-2(lower)
PLATE GPLATE SPLATE CPLATE	Density t 1	3*N	Pointer-1
BRICK	Density	3*N	Pointer-1

TYPE	PROPERTIES	WORDS	FACTOR
SCALAR	wt	3	Pointer-1
	Ixx		
	Iyy		
	Izz		
	Ixy		
	Ixz		
	Iyz		

1 If the plates are tapered the thicknesses at the nodes are stored in the node sequence. (t1, t2, ... tn)

where:

Wt = weight
Ji
IYi = area moments at node i
IZi
Ai = cross-sectional area at node i
Ikj = weight moment of inertias
t = thickness
N = number of nodes describing the element

<u>Generation</u>: Program GEOMTRY of the mass processor.

FUEL/PAYLOAD GEOMETRY MATRIX

File:	MASSRNF
Index Name:	GFff01a, GFff02a, ..., GFff99a (Fuel) GPpp01a, GPppC2a, ..., GFpp99a (Payload)
Type:	REAL
Dimensions:	M*1 where M is the matrix block size (currently 4000)
Auxiliary ID:	Word 1: MASSRNF Word 2: The matrix index name Word 3: Number of elements in this block Word 4: Internal number of the first element in this block. Word 5: Internal number of the last element in this block. Words 6-10: Zero
Elements:	Fuel - The tetrahedron geometry describing the fuel distribution is stored as follows: Fuel density, X1, Y1, Z1, X2, Y2, Z2, ..., X4, Y4, Z4. Payload - The tetrahedron and scalar geometry describing the payload distribution is stored as follows: (tetrahedrons) Cargo density, X1, Y1, Z1, X2, Y2, Z2, ..., X4, Y4, Z4 (scalars) Wt, Ixx, Iyy, Izz, Ixy, Ixz, Iyz, X1, Y1, Z1.
Generation:	Programs FUELELM and PAYELM of the mass processor.

ELEMENT INDEX MATRICES

File:	MASSRNF	
Index Names:	IDXK00a - (Stiffness) IDXM00a - (Mass elements) IDXFffa - (Fuel elements) IDXPppa - (Payload elements)	
Type:	MIXED	
Dimensions:	M * 3 where M is equal to the number of elements in the corresponding element data set.	
Auxiliary ID:	Word 1:	MASSRNF
	Word 2:	The matrix index name
	Word 3:	The number of mass and geometry data blocks for the corresponding data set.
	Words 4-10:	Zero
Elements:	Row i of the matrix contains the following information for the ith internal element.	
Item 1:	Bits 59:	Taper indicator for plates and covers. 0 = uniform thickness 1 = tapered
	Bits 58-54:	The element type code
	Bits 53-47:	The number of nodes describing the element
	Bits 46-37:	The number of the geometry data block that contains the data for element i
	Bits 36-25:	The row of the geometry matrix where the data for the ith element begins
	Bits 24-15:	The number of the element mass data block that contains the data for element i
	Bits 14-0:	The row of the element mass matrix where the data for the ith element begins

Item 2:	Bits 59-45:	The element user identification
	Bits 44-30:	The element input record number
	Bits 29-0:	Reserved

Item 3: The element label

<u>Generation</u>: Programs GEOMTRY and TØTALWT of the mass processor.

FUEL/PAYLOAD INDEX MATRICES

File:	MASSRNF	
Index Names:	IDXFffa - (Fuel) IDXPppa - (Payload)	
Type:	MIXED	
Dimensions:	M * 3 where M is equal to the number of elements describing the fuel/payload distribution corresponding to the condition ff/pp.	
Auxiliary ID:	Word 1:	MASSRNF
	Word 2:	The matrix index name
	Word 3:	The number of mass and geometry data blocks for the corresponding condition.
	Words 4-10:	Zero
Elements:	Row i of the matrix contains the following information for the ith internal element.	
Item 1:	Bits 59-54:	The element type code
	Bits 53-47:	The number of nodes describing the element
	Bits 46-37:	The number of the geometry data block that contains the data for element i
	Bits 36-25:	The row of the geometry matrix where the data for the ith element begins
	Bits 24-15:	The number of the element mass data block that contains the data for element i
	Bits 14-0:	The row of the element mass matrix where the data for the ith element begins
Item 2:	Zero	

Item 3: Fuel

Bits 59-51:	Condition identification
Bits 50-42:	Fuel management sequence number
Bits 41-33:	Pointer to the attitude matrix
Bits 32-15:	Reserved
Bits 14-0:	User id of the fuel tank containing the ith tetrahedron.

Payload

Bits 59-51:	Condition identification
Bits 50-42:	Payload loading sequence number
Bits 41-30:	Number of passengers
Bits 29-0:	User id of the cargo hold containing this tetrahedron. (Zero if passenger)

Generation: Program PAYELM of the mass processor.

ELEMENT MASS MATRIX

File:	MASSRNF	
Index Name:	MA0001a, MA0002a, ..., MA9999a	
Type:	MIXED	
Dimensions:	LN*1, where LN < 5000. The dimensions are reduced such that the mass matrix for the last element in the block is wholly contained in one block.	
Auxiliary ID:	Word 1:	MASSRNF
	Word 2:	The matrix index name.
	Word 3	Number of elements in this data set
	Word 4:	Internal number of the first element in this block
	Word 5:	Internal number of the last element in this block
	Words 6-10:	Zero

Elements:

Item 1: Identification word containing 4 packed integers

Bits 59-36:	MASS (display code)
Bits 35-30:	Zero
Bits 29-15:	Internal number of first element in this block
Bits 14- 0:	Internal number of last element in this block

Item 2-LN: Element mass matrix data, stored in order of internal element number. The data for each element is stored as follows:

Word 1 is an ID word containing 4 packed integers

Bits 59-45:	Internal element number
Bits 44-30:	Element type
Bits 29-15:	NF, number of kinematic freedoms
Bits 14- 0:	Zero

Words 2-(NF+1) contain runcodes, each consisting of 2 packed integers.

Bits 59-30: Internal node number

Bits 29- 0: Freedom number

Words (NF+2)-(NF*(NF+3)/2 contain matrix terms, stored rowwise, lower triangular, full.

Generation: Program LUMPGEN of the mass processor.

DIAGONAL MASS MATRICES

File:	MASSRNF
Index Name:	MDCqqqa (user matrix)
Type:	MIXED
Dimensions:	NFREE*1 where NFREE equals the number of retained freedoms.
Auxiliary ID:	Word 1: MASSRNF Word 2: MDCqqqa Word 3: DIAGONAL Words 4-9: Zero Word 10: The data set number
Elements:	The diagonal mass terms are stored consecutively as a vector.
Generation:	Program MRGMASS of the mass processor.

NON-DIAGONAL MASS MATRICES

File:	MASSRNF
Index Name:	MDCqqqa (user matrix)
Type:	MIXED
Dimensions:	N*1 where N is variable depending on the sparseness of the matrix.
Auxiliary ID:	Word 1: MASSRNF Word 2: MDCqqqa Word 3: FULL Words 4-9: Zero Word 10: The data set number
Elements:	The mass matrix terms are stored in a row-wise, lower triangular format. (Sparse format, no leading zeros.)
Generation:	Program MRGMASS of the mass processor.

AUXILIARY PANEL WEIGHT MATRICES, NO INERTIAS

File: MASSRNF

Index Name: MDCqqqa

Type: MIXED

Dimensions: (NPAN+NMAS) * 5 where NPAN equals the number of auxiliary panels defined and NMAS equals the number of concentrated masses requested.

Auxiliary ID:

Word 1:	MASSRNF
Word 2:	MDCqqqa
Words 3-9:	Zero
Word 10:	The data set number

Elements: Rows 1 to NPAN contain the following auxiliary panel data:

Item 1: A 8 character panel identification of the form AUXxxxxx. Where xxxxx equals the input panel identification.

Item 2: Panel weight

Item 3: X, Y, Z, coordinates of the panel center of gravity

Rows NPAN+1 to NPAN+NMAS contain the following concentrated mass data:

Item 1: The concentrated mass identification

Item 2: Weight

Item 3-5: X, Y, Z, coordinates of the mass center of gravity.

Generation: Program ASSMBLY of the mass processor.

AUXILIARY PANEL WEIGHT MATRICES, WITH INERTIAS

File:	MASSRNF
Index Name:	MDCqqqa
Type:	MIXED
Dimensions:	(NPAN+NMAS) * 11 where NPAN equals the number of auxiliary panels defined and NMAS equals the number of concentrated masses requested.
Auxiliary ID:	Word 1: MASSRNF Word 2: MDCqqqa Words 3-9: Zero Word 10: The data set number
Elements:	Rows 1 to NPAN contain the following auxiliary panel data:
Item 1:	A 8 character panel identification of the form AUXxxxxx where xxxxx equals the input panel identification
Item 2:	Panel weight
Item 3-5:	X, Y, Z, coordinates of panel center of gravity
Item 6-11:	Panel inertias about panel center of gravity (Ixx, Iyy, Izz, Ixy, Ixz, Iyz)
	Rows NPAN+1 to NPAN+NMAS contain the following concentrated mass data.
Item 1:	The concentrated mass identification
Item 2:	Weight
Item 3-5:	X, Y, Z, coordinates of the mass center of gravity
Item 6-11:	Mass inertias about the mass center of gravity (Ixx, Iyy, Izz, Ixy, Ixz, Iyz)
Generation:	Program ASSMBLY of the mass processor.

FREEDOM ACTIVITY VECTOR

File: MASSRNF

Index Name: MFAV00a,MFAV0ga

Type: MIXED

Dimensions: ((N+3)/4) * 1 where N is the number of nodes.

Auxiliary ID:

Word 1:	MASSRNF
Word 2:	The matrix index name.
Word 3:	Bits 59-45, 15 bits associated left to right with freedoms TX, TY, etc. A zero bit indicates that no node has mass for this freedom; a one bit that at least one node has mass for this freedom. Bits 44-0, reserved for future use.
Words 4-10:	Zero

Elements: Item j consists of 4 packed 16 bit integers. The 15 bits are associated (left-to-right) with the fifteen degrees of freedom at the corresponding internal node. A "0" bit indicates no mass for the corresponding freedom; a "1" bit indicates mass.

Bits 59-45:	Node 4j-3
Bits 44-30:	Node 4j-2
Bits 29-15:	Node 4j-1
Bits 14-0:	Node 4j

Generation: Program LUMPGEN of the mass processor.

ELEMENT MASS DATA

File: MASSRNF

Index Name:
MK0001a, MK0002a, ..., MK9999a (Stiffness elements)
MM0001a, MM0002a, ..., MM9999a (Mass elements)
MFff01a, MFff02a, ..., MFff99a (Fuel)
MPpp01a, MPpp02a, ..., MPpp99a (Payload)

Type: MIXED

Dimensions: M * 1 where M equals 10 * (the number of elements stored in the corresponding element geometry data block).

Auxiliary ID:

Word 1:	MASSRNF
Word 2:	The matrix index name
Word 3:	Number of elements in this block
Word 4:	Internal number of the first element in this block
Word 5:	Internal number of the last element in this block
Words 6-10:	Zero

Elements: The mass data for each element is stored sequentially as follows:

WEIGHT

XCG
YCG — Center of Gravity
ZCG

IXX
IYY
IZZ — Moments of inertia about the global axis origin
IXY
IXZ
IYZ

Each spar element contains 3 blocks of data (upper cap, lower cap, web)
Each cover element contains 2 blocks of data (upper surface, lower surface)

Generation: Program TOTALWT of the mass processor.

SUBSTRUCTURE MASS MATRICES

File:	MASSPNF
Index Name:	MREDsss (user matrix)
Type:	MIXED
Dimensions:	N*1 where N is variable depending on the sparseness of the matrix
Auxiliary ID:	Words 1-10: Zero
Elements:	The mass matrix terms are stored in a row-wise, lower triangular format. (Sparse format, no leading zeros.)
Generation:	Program SUBMASS of the mass processor.

CONDITION SUMMARY MATRIX

File:	MASSRNF
Index Name:	TAPLWTa
Type:	MIXED
Dimensions:	CN * 11 where CN = the number of defined mass distribution conditions.
Auxiliary ID:	Word 1: MASSRNF Word 2: TAPLWTa Words 3-10: Zero
Elements:	Each row of the matrix contains the following data for each condition:
Item 1:	The mass matrix index name corresponding to this row of data or the name TPROPga where g equals the concentrated mass subset number requested (or 0) and a equals the display code equivalent of the data set number.
Item 2:	Total weight of this mass distribution condition
Item 3-5:	X, Y, Z coordinates of the center of gravity
Item 6-11:	Total inertias about center of gravity (Ixx, Iyy, Izz, Ixy, Ixz, Iyz)
Generation:	Programs ASSMBLY and MRGMASS of the mass processor.

DATA SUBSET TOTAL MASS PROPERTIES MATRIX

File: MASSRNF

Index Name: TØTLWTa

Type: MIXED

Dimensions: (4+CM+PP+FF) * 11 where CM equals the number of concentrated mass subsets, PP equals the number of payload subsets, and FF equals the number of fuel subsets.

Auxiliary ID:

Word 1:	MASSRNF
Word 2:	TØTLWTa
Words 3-10:	Zero

Elements: The rows of the matrix contain the data for the following element subsets:

Row 1 contains flexible element data

Row 2 contains mass element data

Row 3
.
. contains concentrated mass data

Row 2+CM

Row 3+CM
.
.
. contains fuel data
.

Row 2+CM+FF

Row 3+CM+FF

.
.
. contains payload data
.

Row 2+CM+PP+FF

Each row of the matrix contains the following data:

Item 1: Identification

Item 2: Total element subset weight

Item 3-5: X, Y, Z coordinates of the center of gravity

Item 6-11: Inertias about global axis system origin (Ixx, Iyy, Izz, Ixy, Ixz, Iyz)

Generation: Program TOTALWT of the mass processor.

FREEDOM ASSIGNMENT TABLE

File: MERGRNF

Index Name: IFATsss

Type: MIXED

Dimensions: 2*N where N is the number of nodes in substructure sss.

Auxiliary ID:

Word 1:	MERGRNF
Word 2:	IFATsss
Words 3-10:	Zero

Elements: Column j contains the freedom assignment information for internal node j. The contents of the two items are as follows:

Item 1:

Bits 59-15: This field contains 15 3-bit integers, representing the 15 degrees of freedom for the node j. Each 3-bit field contains an integer in the range 0-4 indicating the freedom type. The code is as follows:

Value	Type
0	not active
1	free (F)
2	retain (R)
3	support (S)
4	constrained

Bits 14-0: 15 bit integer giving the number of active freedoms for the node.

Item 2:	Bits 59-45:	Number of free freedoms up to node j.
	Bits 44-30:	Number of retained freedoms up to node j
	Bits 29-15:	Number of supported freedoms up to node j
	Bits 14-0:	Number of constrained freedoms up to node j

<u>Generation</u>: The MRGSET of the merge processor.

FREEDOM ASSIGNMENT TABLE

File: MERGRNF

Index Name: KFAT0ba

Type: MIXED

Dimensions: 2 * N where N is the number of nodes

Auxiliary ID:

Word 1:	MERGRNF
Word 2:	KFAT0ba
Words 3-10:	Zero

Elements: Column j contains the freedom assignment information for internal node j. The contents of the two items are as follows:

Item 1:

Bits 59-15: This field contains fifteen 3-bit integers representing the 15 degrees of freedom for the node j. Each 3-bit field contains an integer in the range 0-4 indicating the freedom type. The code is as follows:

Value		Type
0	-	Not active
1	-	Free (F)
2	-	Retain (R)
3	-	Support (S)
4	-	Constrain (C)

Bits 14- 0: 15-bit integer giving the number of active freedoms for the node

Item 2:	Bits 59-45:	Number of Free freedoms up to node j
	Bits 44-30:	Number of Retained freedoms up to node j
	Bits 29-15:	Number of Supported freedoms up to node j
	Bits 14- 0:	Number of Constrained freedoms up to node j

<u>Generation</u>: Program MRGSET of the merge processor.

RETAINED FREEDOM CORRESPONDENCE TABLE

File: MERGRNF

Index Name: KRTC0ba

Type: MIXED

Dimensions: N*1 where N is the dimension of the reduced matrix for this data set and execution stage.

Auxiliary ID:

Word 1:	MERGRNF
Word 2:	KRTC0ba
Words 3-10:	Zero

Elements: The ith item contains the following data:

Bits 59-30:	The number of the retained freedom in the assembly control vector which corresponds to the ith retained freedom in the retained freedom vector.
Bits 29-0:	The number of the retained freedom in the retained freedom vector which corresponds to the ith retained freedom in the assembly control vector.

Generation: Program MRGSET of the merge processor.

USER FREEDOM REFERENCE TABLE

File:	MERGRNF	
Index Name:	KUFRT0a	
Type:	MIXED	
Dimensions:	95 * NS where NS is the number of defined boundary condition and superpositon stages.	
Auxiliary ID:	Word 1:	MERGRNF
	Word 2:	KUFRT0a
	Words 3-10:	zero
Elements:	The ith column corresponds to the ith input boundary condition or superposition stage. The row entries are:	
Item 1:	Stage number (integer).	
Item 2:	Bits 59-18:	User selected freedom activity label for partition 1 of the equilibrium equations (H format). Default is 4HFREE.
	Bits 17-0:	Sum of partition 1 type freedoms.
Item 3:	Bits 59-18:	Same as Item 2 but for partition 2. Default is 6HRETAIN.
	Bits 17-0:	Sum of partition 2 type freedoms.
Item 4:	Bits 59-18:	Same as Item 2 but for partition 3. Default is 7HSUPPORT.
	Bits 17-0:	Sum of partition 3 type freedoms.
Item 5:	Reserved for future use.	

Item 6-20: User selected freedom labels (2 character BCD left-adjusted blank-filled words) for man/machine communications associated with the internal kinematic freedoms 1-15, respectively, for all rectangular Cartesian coordinate reference frames associated with set X and state i. Default words are TX, TY, TZ, RX, RY, and RZ, respectively.

Item 21-35: Same as items 6-20 but for all cylindrical reference frames. Default words are TR, TT, TZ, RR, RT, and RZ, respectively.

Item 36-50: Same as items 6-20 but for all spherical reference frames. Default words are TR, TT, TP, RR, RT, and RP, respectively.

Item 51-65: User selected freedom-force labels (2 character BCD left-adjusted blank-filled words) for man/machine communications associated with the internal force freedoms 1-15, respectively, for all rectangular Cartesian coordinate reference frames associated with set X and stage i. Default words are FX, FY, FZ, MX, MY, and MZ, respectively.

Item 66-80: Same as items 51-65 but for all cylindrical reference frames. Default words are FR, FT, FZ, MR, MT, and MZ, respectively.

Item 81-95: Same as items 51-65 but for all spherical reference frames. Default words are FR, FT, FP, MR, MT, and MP, respectively.

<u>Generation</u>: Program MRGSET of the merge processor.

MULTRNF

(Only user matrices as described in reference 1-1 are written on MULTRNF)

RHO3 CONDITION CONTROL MATRIX

File: RHO3RNF

Index Name: ACMij00

Type: MIXED

Dimensions: N*1 where N=(16+ number of K-values + number of Mach numbers)

Auxiliary ID:

Word 1:	RHO3RNF
Word 2:	ACMij00
Words 3-10:	Zero

Elements:

Item 1:	Bits 59-30:	Number of constants (9)
	Bits 29-0:	Pointer to the first constants (6)
Item 2:	Bits 59-30:	Number of K values (NOKVAL)
	Bits 29-0:	Pointer to the first K value (15)
Item 3:	Bits 59-30:	Number of Mach number (NOMACH)
	Bits 29-0:	Pointer to the first Mach number (NOKVAL+15)
Item 4:	Bits 59-30:	Number of problem size indicators (3)
	Bits 29-0:	Pointer to the first problem size indicator (NOKVAL+NOMACH+18)
Item 5:	Bits 59-30:	Number of matrix size indicators (1)
	Bits 29-0:	Pointer to the first matrix size indicator (NOKVAL+NOMACH+18)
Item 6:	B0, Root semi-chord	
Item 7:	SPAN, semi-span	

Item 8: SYM, symmetry indicators
1=symmetric
2=antisymmetric

Item 9: NSPOPT, non-symmetric planform option

Item 10: GFOPT, generalized force option

Item 11: GFPOPT, generalized force print option

Item 12: CHECK, checkout indicator

Item 13: K-values

Item 13+NOKVAL:

Mach numbers

Item 13+NOKVAL+NOMACH:

NWTMDS, number of c/modes

Item 14+NOKVAL+NOMACH:

Zero

Item 15+NOKVAL+NOMACH:

NDWMDS, number of downwash modes

Item 16+NOKVAL+NOMACH:

Zero

Generation: Program MIPREP of the RHO3 processor.

C-MATRIX INDEX TABLE

File:	RHO3RNF	
Index Name:	CM00000	
Type:	MIXED	
Dimensions:	18*50	
Auxiliary ID:	Word 1:	RHO3RNF
	Word 2:	CM00000
	Word 3:	Number of main surface C-matrix entries in the table (maximum of 50)
	Word 4:	Number of C-matrices accessible via the index table (maximum of 250)
	Words 5-10:	Zero

Elements: Each main surface entry in the table occupies one column in the matrix. Each column contains the following data:

Item 1:	Bits 59-18:	Seven character main surface identification
	Bits 17-0:	An integer number indicating the chronological order in which the C-matrix was generated.
Item 2:	Bits 59-48:	Zero
	Bits 47-42:	1--Symmetric solution 2--Antisymmetric solution 3--Nonsymmetric solution
	Bits 41-36:	NLE--Number of leading edge definition points
	Bits 35-30:	NTE--Number of trailing edge definition points
	Bits 29-24:	NDWC--Number of downwash chords
	Bits 23-18:	NPDWC--Number of points on a downwash chord

	Bits 17-12:	NSPT--Number of spanwise pressure terms
	Bits 11-6:	NCPT--Number of chordwise pressure terms
	Bits 5-0:	NOCS--The number of control surfaces

Item 3: SPAN-wing semi-span

Item 4: B0--Root semi-chord

Item 5: K-value

Item 6: Mach number

Item 7-13: Run title

Item 14: Main surface entry date

Item 15-18: Data for control surfaces 1-4 are stored as follows:

Bits 59-18:	Seven character control surface identification
Bits 17-9:	An integer number indicating the chronological order in which the C-matrix was generated
Bits 8-0:	The control surface type 1=Full trailing edge 2=Tip trailing edge 3=Mid trailing edge 4=Partial trailing edge 5=Full leading edge 6=Tip leading edge 7=Mid leading edge 8=Partial leading edge

<u>Generation</u>: Program RDWRTC of the RHO3 processor.

C-MATRIX

File:	RHO3RNF
Index_Name:	CMi0000
Type:	REAL
Dimensions:	(2*NDWP)*NPTRM (NDWP*NPTRM complex)

Where

NDWP = the number of downwash points
NPTRM = the number of pressure terms
(NPTRM=4 for a control surface)

Auxiliary_ID:

Word 1:	RHO3RNF
Word 2:	CMi0000
Word 3:	K-value
Word 4:	Bo--Root semi-chord
Word 5:	Mach number
Word 6:	SPAN-wing semi-span
Words 7-10:	Zero

Elements: Let Cpq(i,j) be the element of the (p,q) partition of the C-matrix. The value of Cpq(i,j) is the downwash value at the i-th downwash point on the p-th downwash chord due to the assumed pressure mode composed of the product of the j-th spanwise and q-th chordwise pressure terms.

Generation: Programs RDWRTC and CMCALC of the RHO3 processor.

FULL DOWNWASH MATRIX

File: RHO3RNF

Index Name: DW0ijkl

Type: REAL

Dimensions: (2*NDWP)*NDSMDS (NDWP*NDWMDS complex)

Where:

NDWP = number of downwash points
NDWMDS = number of downwash modes

Auxiliary ID:
Word 1: RHO3RNF
Word 2: DW0ijkl
Words 3-10: Zero

Elements: Items (i,j)p and (i+1,j)p equal the real and imaginary parts of the kinematic downwash at the i-th downwash point on the p-th downwash chord due to the j-th vibration mode (downwash mode). The indices i,j and p are defined as follows:

i = 1,2,... NPDWC (number of downwash points per chord) ordered from the most forward point on each chord or from the first user input point on each chord.

p = 1,2,... NDWC (number of downwash chords) ordered from the most outboard chord or from the first user input chord position.

j = 1,2,... NDWMDS in the order of the input modes

Generation: Program PCOEFF of the RHO3 precessor.

MODIFIED DOWNWASH MATRIX

File: RHO3RNF

Index Name: DWMijkl

Type: REAL

Dimensions: (2*NDWP)*NDWMDS (NDWP*NDWMDS complex)

Where:

NDWP = number of downwash points
NDWMDS = number of downwash modes

Auxiliary ID:

Word 1:	RHO3RNF
Word 2:	DWMijkl
Words 3-10:	Zero

Elements: The elements of the modified downwash matrix are calculated by subtracting the mathematical downwash due to control surface rotation from the kinematic downwash for each downwash point and stored in the same format as the full downwash matrix.

Generation: Program PCOEFF of the RHO3 processor.

GENERALIZED FORCES

File:	RHO3RNF
Index Name:	GF0ijkl
Type:	REAL
Dimensions:	(2*NWTMDS)*NDWMDS (NWTMDS*NDWMDS complex)

Where:

NWTMDS = number of weighting function modes
NDWMPS = number of downwash modes

Auxiliary ID:

Word 1:	RHO3RNF
Word 2:	GF0ijkl
Word 3:	K-value
Word 4:	B0 - root semi-span
Word 5:	Mach number
Word 6:	SPAN - wing semi-span
Words 7-10:	Zero

Elements: Element (i,j) is the work done by the motion of the lifting surface in the i-th mode acting against the unsteady aerodynamic pressure in the j-th mode divided by the dynamic puressure.

Generation: Program GFORCE of the RHO3 processor.

CUBIC HINGE ROTATION COEFFICIENTS

File: RHO3RNF

Index Name: HCmij00

Type: REAL

Dimensions: 4*NDWMDS where NDWMDS equals the number of downwash modes

Auxiliary ID:

Word 1:	RHO3RNF
Word 2:	HCmij00
Words 3-10:	Zero

Elements: The elements of the i-th column are the four cubic coefficients of hinge rotation for the i-th mode for the control surface associated with this matrix.

Generation: Program MIPREP of the RHO3 processor.

MODAL SLOPES AND DEFLECTIONS

File: RHO3RNF

Index Name: MØ0ij00

Type: REAL

Dimensions: (2*NDWP)*NWTMDS

Where:

NDWP = number of downwash points
NWTMDS = number of weighting modes

Auxiliary ID:

Word 1: RHO3RNF
Word 2: MØ0ij00
Words 3-10: Zero

Elements: Elements 1,i,j and 2,i,j are the streamwise slope and deflection of the i-th downwash point for the j-th interpolated mode shape.

Generation: Program DWPREP of the RHO3 processor.

UNSTEADY PRESSURE REPORT

File:	RHO3RNF
Index Name:	PR0ijkl
Type:	REAL
Dimensions:	(2*INPPT)*NDWMDS (NPPT*NDWMDS complex)

Where:

NPPT = number of pressure report points
NDWMDS = number of downwash modes

Auxiliary ID:

Word 1:	RHO3RNF
Word 2:	PR0ijkl
Word 3:	K-value
Word 4:	B0 - root semi-span
Word 5:	Mach number
Word 6:	SPAN - wing semi-span
Words 7-10:	Zero

Elements: Elements (i,j) and (i+1,j) are the real and imaginary parts of the unsteady pressure at pressure report point i for the j-th downwash mode.

Generation: Program PRESURE of the RHO3 processor.

PRESSURE SERIES COEFFICIENTS

File: RHO3RNF

Index Name: PS0ijkl

Type: REAL

Dimensions: (2*NPTRM)*NDWMDS (NPTRM*NDWMDS complex)

Where:

NPTRM = number of pressure terms
NDWMDS = number of downwash modes

Auxiliary ID:

Word 1:	RHO3RNF
Word 2:	PS0ijkl
Words 3-10:	Zero

Elements: Items (i,j)q and (i+1,j)q of the q-th rot partition equal the real and imaginary parts of the coefficient for the assumed pressure mode composed of the product of the i-th spanwise pressure term and the q-th chordwise pressure term due to the modified downwash calculated from the j-th vibration mode (downwash mode)

Generation: Program PCOEFF of the RHO3 processor.

RHO3 CASE DATA MATRIX

File:	RHO3RNF	
Index Name:	R30ij00	
Type:	MIXED	
Dimensions:	2008*1	
Auxiliary ID:	Word 1:	DATARNF
	Word 2:	R30i000
	Words 3-10:	Zero

Elements: The array contains the contents of the RHO3 adjacently stored labeled common blocks:

BASIC	CSGEOM
OPTIONS	TABLE
COUNT	COND
MSGEOM	FILES
	RO3MOD

BASIC contains constants, counter, and key RHOIII options.

COMMON /BASIC/

ZERO	=	Complex zero
PI	=	Value of PI
PI02	=	PI/2
INDCM	=	C-Matrix indicator, B=main surface, N=control surface
SYM	=	Symmetry indicator, 1-symmetric, 2-antisymmetric
SPAN	=	Semispan
B0	=	Root semichord (or some other reference length)
SH	=	Span/B0
KVAL	=	K-value, reduced frequency = B0*OMEGA/V
MACH	=	Mach number
BETA	=	SQRT (1-Mach**2)
KSQD	=	KVAL**2
BETASQD	=	BETA**2

RHO3RNF = Name of the RHO3 output random name file. INPREP extracts the name from the ATLAS labeled common block KQRNDM. It is normally equal to 7LRHO3RNF.

NCASE = The data case number for the current RHO3 data case

NCOND = The data condition number for the current RHO3 data condition.

OPTIONS contains variables choosing optional paths.

COMMON /OPTIONS/

CMOPT = C-Matrix option,
.T.=Generate a new C-matrix file
.F.=Use/update an old C-matrix file

PRSOPT = Pressure report option,
.T.=Report unsteady pressure at default or user defined locations
.F.=No report

SGFOPT = Sectional generalized force option,
.T.=Report sectional generalized forces at default or JSER defined chords,
.F.=No generalized force calculations

GEXOPT = Gust excitation option,
.T.=Include a gradual or non-gradual penetration gust mode

VPOPT = Velocity profile option,
.T.=Modify modal input by user supplied velocity profile = V(LOCAL)/V(INFINITY)

MINPOPT = Modal input print option,
.T.=Print input points and deflections

MOPOPT = Modal output print option,
.T.=Print interpolated deflection and slope at downwash points

DWPOPT = Downwash print option,
.T.=Print downwash matrix

PCPOPT = Pressure coefficient print option,
.T.=Print coefficients of the assumed pressure series

GFFOPT	=	Generalized force print option, -1=Print no generalized forces 0=Print all generalized forces N=Print first N generalized forces
SFSOPT	=	Scratch file save option, .T.=Do not delete scratch files RHOSC1 and RHOSC2 following job completion, .F.=Delete scratch files
ATLASOP	=	ATLAS input option, .T.=MIFILE will be a SNARK I/O sequential file containing modal input point coordinates and deflection .F.=No ATLAS type input
NSPOPT	=	Non-symmetric planform option, .T.=Planform specified has no mirror image, e.g., fin, .F.=Standard mirror image planform
MITOPT	=	Modal input point transformation option, .T.=Do not perform coordinate transformation on inpoint points in surface spline interpolation

COUNT contains variables defining the problem size

COMMON /COUNT/

NDWC	=	Number of downwash chords
NPDWC	=	Number of points per downwash chord
NDWP	=	Number of downwash point=NDWC*NPDWC
NSPT	=	Number of spanwise pressure terms
NCPT	=	Number of chordwise pressure terms
NPTRM	=	Number of assumed pressure modes= NSPT*NCPT
NPRC	=	Number of pressure report chords
NPPRC	=	Number of points per pressure report chord
NPPT	=	Number of pressure report points= NPRC*NPPRC
NSGFC	=	Number of sectional generalized force report chords
NDWMDS	=	Number of downwash modes
NWTMDS	=	Number of weighting function modes Note NDWMDS=NWIMDS+1(if GEXOPT=.T.)
NOKVAL	=	Number of reduced frequencies

IKVAL	=	Reduced frequency counter
NOMACH	=	Number of Mach numbers
IMACH	=	Mach number counters
ICOND	=	Condition counter
NSGP	=	Number of structural grid (modal input) points

MSGEOM contains main surface geometry data

COMMON /MSGEOM/

MSID	=	Main surface C-matrix ID
YDWC(9)	=	Downwash chords
XDWP(72)	=	Downwash points
DXLEDWC(9)	=	Slope of leading edge at downwash chord intersect
XGUST	=	Zero phase reference point for a gradual penetration gust mode
YROOT	=	Y value of planform root from user input YLE, used to relocate all Y values about zero
XMDWC(9)	=	Mid-chord of downwash chords
BOWC(9)	=	Semi-chord value of downwash chord
DXTEDWC(9)	=	Slope of trailing edge at downwash chord intersect
NLE	=	Number of leading edge definition points
XLE(10)	=	X-value leading edge definition points
YLE(10)	=	Y-value of leading edge definition points
DXLEDY(9)	=	Slope of leading edge definition lines
XLEDWC(9)	=	Leading edge of downwash chords
NTE	=	Number of trailing edge definition points
XTE(10)	=	X-value of trailing edge definition points
YTE(10)	=	Y-value of trailing edge definition points
DXTEDY(9)	=	Slope of trailing edge definition lines
XTEDWC(9)	=	Trailing edge of downwash chords

CSGEOM contains surface geometry data

COMMON /CSGEOM/

NOCS	=	Number of control surfaces
CSID(4)	=	Control surface C-matrix ID
CSTYPE(4)	=	Control surface type, 1=full, 2=tip, 3=mid, 4=partial
CSRS(4)	=	Surface to which control surface is related (attached)
HGAP(4)	=	Gap at hinge between main surface and control surface
XHLI(4)	=	X-value inboard hinge definition point
YHLI(4)	=	Y-value inboard hinge definition point
XHLBARI(4)	=	X-bar value of L.E. of inboard C/S side edge
XHLO(4)	=	X-value outboard hinge definition
YHLO(4)	=	Y-value outboard hinge definition point point
XHLBARO(4)	=	X-bar value of L.E. of outboard C/S side edge
DXHLDY(4)	=	Slope of hinge line
XHLDWC (4,9)	=	Hinge intersection of downwash chord
DXHLDWC (4,9)	=	Slope of hinge at downwash chord intersect

TABLE will contain the RHO3 C-matrix index table

COMMON /TABLE/

RTITLE(9)	=	Run title with date appended
TABLE (18,50)	=	CMFILE table of contents
NOMAT	=	Number of C-matrices in CMF1 file of CMFILE
ITHMAT	=	The number of a C-matrix on (or to be put on) CMFILE. When extracting a C-matrix from CMFILE, ITHMAT will be the one to be read. After writing a C-matrix on CMFILE, NOMAT and ITHMAT will be equal.

The following variables are stored in TABLE prior to C-matrix generation or use. They will be stored elsewhere or discarded before TABLE is needed for C-matrix indexing.

(TABLE,YPC),	(TABLE(12,1),XPPT),
(TABLE(9,14),PXLE),	(TABLE(2,15),PDSLEDE),
(TABLE(13,15),PXMID),	(TABLE(6,16),PXHL),
(TABLE(14,180,PDXHLDE),	(TABLE(4,21),PXTE),
(TABLE(15,21),PDXTEDE),	(TABLE(8,22),PB),
(TABLE(1,23),YSGFC),	(TABLE(4,24),XLESGF),
(TABLE(7,25),DXLDESF),	(TABLE(10,26),XMIDSGF),
(TABLE(13,27),XHLSGF),	(TABLE(7,32),DXHLSGF),
(TABLE(1,37),XTESGF),	(TABLE(4,38),DXTDESF),
(TABLE(7,39),BSGF),	(TABLE(10,40),NVPPTS),
(TABLE(11,40),VPFL),	(TABLE(1,42),XVP),
(TABLE(9,43),COFVP),	(TABLE(1,49),DVPFL),

Variables associated with pressure report

YPC	=	Spanwise stations of chords containing pressure report points
XPPT	=	X-coordinates of pressure report points on the chords YPO
PXLE	=	Chord intersect with leading edge
PDXLEDE	=	Slope of leading edge at PXLE
PXMID	=	X-coordinate of chord midpoint
PXHL	=	Chord intersection with control surface hinge line(s) or the constant percent chord extension(s)
PDXHLDE	=	Slope of line intersection chord at PXHL
PXTE	=	Chord intersect with trailing edge
PDXTEDE	=	Slope of trailing edge at PXTE
PB	=	Length of semi-chord

Variables associated with sectional generalized forces

YSGFC	=	Spanwise stations of chords for sectional generalized forces
XLESGF	=	Chord leading edge intersect
DXLDESF	=	Slope of leading edge at XLESGF
XMIDSGF	=	X-coordinate of chord midpoint
XHLSGF	=	Chord intersection with control surface hinge line(s) of the constant percent chord extension(s)

DXHLSGF	=	Slope of line intersecting chord at XHLSGF
XTESGF	=	Chord trailing edge intersect
DXTDESF	=	Slope of trailing edge at XTESGF
BSGF	=	Length of semi-chord

Variables associated with velocity profile

VPFL	=	Profile modification
XVP	=	Percent of chord corresponding 1 to 1 with VPFL
COFVP	=	Coefficients for cubic spline passing through the input points
DVPFL	=	Slopes of cubic spline at defining points

COND contains the condition arrays, Mach number and K-values

COMMON /COND/

KVALUE(20)	=	Array of reduced frequencies
MACHNO(20)	=	Array of Mach numbers

FILES contains all of the files used by RHO3 in ATLAS

COMMON /FILES/

CMFILE	=	C-matrix I/O file
CMF1	=	First pertinent file on CMFILE
MIFILE	=	Modal input file
MIF1	=	First pertinent file on MIFILE
MIM1	=	First pertinent matrix in file MIF1 of MIFILE
GFFILE	=	Generalized force output file
GFF1	=	First pertinent file on GFFILE
GFM1	=	First pertinent matrix in file GFF1 of GFFILE
IN	=	Input file (normally standard input)
OUT	=	Output file (normally standard output)
RHOSC1	=	Scratch file, used as DWSFILE= Downwash scratch file
RHOSC2	=	Scratch file, used as CMSFILE= C-matrix scratch file, COFFILE=Pressure coefficient file

FHOSC3	=	Scratch file, used as IFSFILE= Interpolation function scratch file

RO3MOD contains the variables associated with modal data

COMMON		/RO3MOD/
MSOCOF	=	Name of interpolation coefficinet matrix for main surface
CSICOF(4)	=	Name(s) of interpolation coefficient matrices for control surfaces I, I=1, NOCS
MOD1MS	=	The number of the first mode to be used from MSOCOF for the main surface
MOD1CS(4)	=	The number of the first mode to be used from CSICOF for control surface I, I=1, NOCS
NRBM	=	Number of rigid body modes
RBREF(3)	=	Reference point for the NRBM rigid body modes
RBTYPE(6)	=	Type of the NRBM rigid body modes
RBMAG(6)	=	Magnitude of the NRBM rigid body modes
MODECS(4)	=	Array containing one number for each control surface (=0 if no user hinge rotations, otherwise contains name of record on DATARNF±CONTAINING user rotations)
ENDR3D	=	Last word of a RHO3 data case (i.e., last word of labelled common blocks to be passed from the preprocessor to the RHO3 technical module)
CKSMF3D	=	Word available for storage of array CHECKSUM by Matrix1 Read/Write routines

Generation: Program RHOIII of the RHO3 processor.

SECTIONAL GENERALIZED FORCES

File: RHO3RNF

Index Name: SFmijkl

Type: REAL

Dimensions: (2*NWTMDS)*NDWMDS (NWTMDS*NDWMDS complex)

Where:

NWTMDS = number of weighting function modes
NDWMDS = number of downwash modes

Auxiliary ID:

Word 1:	RHO3RNF
Word 2:	SFmijkl
Word 3:	K-value
Word 4:	B0 - root semi-span
Word 5:	Mach number
Word 6:	SPAN - wing semi-span
Word 7:	Section station
Words 8-10:	Zero

Elements: Item Q(i,j) k is the sectional generalized forces matrix for the k-th chord where the (i,j)-th element is the work done on the k-th chord (by the unsteady airforces of the j-th mode acting through the i-th mode) divided by the dynamic load.

Generation: Program SGFORCE of the RHO3 processor.

FREEDOM ACTIVITY VECTOR-GEOMETRIC STIFFNESS

File:	STIFRNF	
Index Name:	GFAV01s	
Type:	MIXED	
Dimensions:	((N+3)/4)*1 where N is the number of nodes.	
Auxiliary ID:	Word 1:	STIFRNF
	Word 2:	GFAV01s
	Word 3:	Bits 59-45 - 15 bits associated left to right with freedoms TX, TY, etc. A zero bit indicates that no node has an active freedom of this kind; a one bit indicates that at least one node has this freedom active. Bits 44-0 - Reserved for future use.
	Words 4-10:	Zero
Elements:	Item j consists of 4 packed 15 bit integers. The 15 bits are associated (left-to-right) with the fifteen degrees of freedom at the corresponding internal node. A "0" bit indicates no geometric stiffness for the corresponding freedom; a "1" bit indicates positive geometric stiffness.	
	Bits 59-45:	Node 4j-3
	Bits 44-30:	Node 4j-2
	Bits 29-15:	Node 4j-1
	Bits 14-0:	Node 4j
Generation:	Program GTRA of the stiffness processor.	

ELEMENT STRESS MATRICES

File:	STIFRNF
Index Name:	GP0001a, GP0002a, ..., GP9999a
Type:	MIXED
Dimensions:	LN*1, where LN equals the buffer size (default 6000 OCTAL). The dimensions are reduced such that the stress matrix for the last element in the block is wholly contained in one block.

Auxiliary ID:

Word 1:	STIFRNF
Word 2:	The matrix index name
Word 3:	The number of elements in this data set.
Word 4:	Internal number of the first element in this block
Word 5:	Internal number of the last element in this block
Words 6-10:	Zero

Elements: The element global stress matrix data for each element is stored as follows:

Item 1: Identification word containing four packed integers:

Bits 59-45:	Element internal number
Bits 44-42:	Storage format code
Bits 41-33:	Reserved for future use
Bits 32-18:	NW, number of words used to store ID, runcodes and elements
Bits 17-9:	M, number of rows of stress matrix
Bits 8-0:	N, number of columns of stress matrix

Item 2-(N+1):

Runcodes--a typical runcode word is associated with a stress matrix column and contains 2 packed 30 bit integers as follows:

Bits 59-30: Node number

Bits 29-0: Freedom number

Item (N+2): NW--global stress matrix elements, stored row-wise, full.

<u>Generation</u>: Program GTRA of the stiffness module.

ELEMENT STIFFNESS MATRIX

File:	STIFRNF
Index Name:	KA0001a, KA0002a, ..., KA9999a
Type:	MIXED
Dimensions:	LN*1, where LN equals buffer size (default 6000 octal). The dimensions are reduced such that the stiffness matrix for the last element in the block is wholly contained in one block.

Auxiliary ID:

Word 1:	STIFRNF
Word 2:	The matrix index name
Word 3:	Number of elements in this data set
Word 4:	Internal number of the first element in this block
Word 5:	Internal number of the last element in this block
Words 6-10:	Zero

Elements:

Item 1: Identification word containing four packed integers

Bits 59-36:	STIF (display code)
Bits 35-30:	Zero
Bits 29-15:	Internal number of the first element in the block
Bits 14-0:	Internal number of the last element in the block

Items 2-LN: Element stiffness matrix data, stored in order of internal element number. Each element is stored as follows:

Word 1: ID word containing four packed integers

Bits 59-45:	Internal element number
Bits 44-30:	Element type

Bits 29-15: NF, number of kinematic freedoms

Bits 14-0: Zero

Words 2-NF+1: Runcodes, each consisting of two packed integers.

Bits 59-30: Internal node number

Bits 29-0: Freedom number

Words NF+2 - NF(NF+3)/2+2:

Matrix terms, stored rowwise, lower triangular, full.

Generation: Program GTRA of the stiffness module.

ELEMENT GEOMETRIC STIFFNESS MATRIX

File: STIFRNF

Index Name: KG0001s, KG0002s, ..., KG9999s

Type: MIXED

Dimensions: LN*1, where LN equals buffer size (default 6000 octal). The dimensions are reduced such that the stiffness matrix for the last element in the block is wholly contained in one block.

Auxiliary ID:

Word 1:	STIFRNF
Word 2:	The matrix index name
Word 3:	Number of elements in this data set
Word 4:	Internal number of the first element in this block
Word 5:	Internal number of the last element in this block
Words 6-10:	Zero

Elements:

Item 1: Identification word containing four packed integers

Bits 59-36:	STIF (display code)
Bits 35-30:	Zero
Bits 29-15:	Internal number of the first element in the block
Bits 14-0:	Internal number of the last element in the block

Items 2-LN: Element stiffness matrix data, stored in order of internal element number. Each element is stored as follows:

Word 1: ID word containing four packed integers

Bits 59-45:	Internal element number
Bits 44-30:	Element type

Bits 29-15: NF, number of kinematic freedoms

Bits 14-0: Zero

Words 2-NF+1: Runcodes, each consisting of two packed integers.

Bits 59-30: Internal node number

Bits 29-0: Freedom number

Words NF+2 - NF(NF+3)/2+2:

Matrix terms, stored rowwise, lower triangular, full.

Generation: Program GTRA of the stiffness module.

FREEDOM ACTIVITY VECTOR

File: STIFRNF

Index Name: KFAV01a

Type: MIXED

Dimensions: ((N+3)/4)*1 where N is the number of nodes.

Auxiliary ID:

Word 1:	STIFRNF
Word 2:	KFAV01a
Word 3:	Bits 59-45 - 15 bits associated left to right with freedoms TX, TY, etc. A zero bit indicates that no node has an active freedom of this kind; a one bit indicates that at least one node has this freedom active. Bits 44-0 - Reserved for future use.
Words 4-10:	Zero

Elements: Item j consists of 4 packed 15 bit integers. The 15 bits are associated (left-to right) with the fifteen degrees of freedom at the corresponding internal node. A "0" bit indicates no stiffness for the corresponding freedom; a "1" bit indicates positive stiffness.

Bits 59-45:	Node 4j-3
Bits 44-30:	Node 4j-2
Bits 29-15:	Node 4j-1
Bits 14-0:	Node 4j

Generation: Program GTRA of the stiffness processor.

BRICK NODAL STRESS MATRIX

File: STRERNF

Index Name: B0001ba, B0002ba, ..., B9999ba

Type: MIXED

Dimensions: M * 1 where M = block size (default 3000) M is increased if necessary to completely hold the stresses for one node for one brick.

Auxiliary ID:

Word 1:	STRERNF
Word 2:	Matrix index name
Word 3:	NLC = no. of loadcases
Words 4-10:	Zero

Elements: The total matrix is composed of a series of sub-blocks each of which contains the stresses at a node for one brick attached to that node. These blocks are sorted in increasing user node number sequence. If more than one brick attaches to a node the sub-blocks for that node are sorted in increasing user element number sequence.

Each sub-block contains the following:

Item 1:	Bits 59-42:	User node number
	Bits 41-24:	Reserved
	Bits 23-9:	User element number
	Bits 8-0:	Material code number
Item 2:	Bits 50-34:	Element temperature + 10000
	Bits 33-17:	N1 of brick
	Bits 16-0:	N2 of brick
Item 3:	Bits 50-34:	N3 of brick
	Bits 33-17:	N4 of brick
	Bits 16-0:	N5 of brick

Item 4: Bits 50-34: N6 of brick

Bits 33-17: N7 of brick

Bits 16-0: N8 of brick

Items 5 to (7*NLC+4):

Stresses for loadcase 1, ..., loadcase NLC

<u>Generation</u>: Program BRKNPNT of the stress postprocessor.

DISPLACEMENT CONTROL MATRIX

File: STRERNF

Index Name: DCNTRba

Type: MIXED

Dimensions: N*1 where N equals the number of nodes.

Auxiliary ID:

Word 1:	STRERNF
Word 2:	DCNTRba
Word 3:	Total number of defined loadcases
Words 4-10:	Zero

Elements: The first J rows contain information for the first J nodes and the J partitions of the DI001ba matrix. The N-J remaining rows contain information for nodes only. A typical row K is as follows:

Bits 59-45:	Last node in partition K of DI001ba or 0.
Bits 44-30:	Binary code describing which freedoms are active for internal node number K (freedoms are numbered left to right).
Bits 29-15:	Partition number of the DI001ba matrix containing displacements for the k-th node.
Bits 14-0:	Position within the DI001ba partition of the start of the displacement data for the k-th node.

Generation: Program DEFLEC of the stress processor.

LOADCASE CORRESPONDENCE TABLE

File:	STRERNF
Index Name:	DCØØRba
Type:	MIXED
Dimensions:	11*N where N is the number of loadcases
Auxiliary ID:	Word 1: STRERNF Word 2: DCØØRba Words 3-10: Zero
Elements:	The i-th column contains the following data for the i-th loadcase.
Item 1:	Contains the user ID for internal loadcase i
Item 2-11:	Contains the 10 word BCD titling string for internal loadcase i.
Generation:	Program SETPARS of the stress processor.

DISPLACEMENT MATRIX

File: STRERNF

Index Name: DI001ba, DI002ba, ..., DI999ba

Type: REAL

Dimensions: M*1 where M=N*NLC; NLC is the number of loadcases and N is the number of active nodal displacements per loadcase that are present in this partition.

Auxiliary ID:

Word 1:	STRERNF
Word 2:	The matrix index name
Words 3-10:	Zero

Elements: The displacements for each node are stored in groups in internal node number order as shown below. (The displacements for one or more nodes are fully contained in one partition)

Displacement of freedom 1 for loadcase 1
Displacement of freedom 1 for loadcase 2
•
•
•
Displacement of freedom 1 for loadcase NLC
Displacement of freedom 2 for loadcase 1
•
•
•
Displacement of freedom 2 for loadcase NLC
•
•
•
Displacement of freedom K for loadcase 1
•
•
•
Displacement of freedom K for loadcase NLC

where K is the number of active freedoms for node i and NLC is the number of loadcases.

The total set of nodal displacements are stored in internal nodal order.

Generation: Program DEFLEC of the stress processor.

FORCE CONTROL MATRIX

File:	STRERNF	
Index Name:	FCNTRba	
Type:	MIXED	
Dimensions:	N * 1 where N equals the number of elements	
Auxiliary ID:	Word 1:	STRERNF
	Word 2:	FCNTRba
	Word 3:	Number of loadcases for which we have forces
	Words 4-10:	Zero
Elements:	Word j has data for internal element number j.	
	Bits 59-45:	Not used
	Bits 44-30:	Number of kinematic freedoms for this element
	Bits 29-15:	Partition number of the FØ001ba matrix containing data for this element
	Bits 14-0:	Position within the FØ001ba matrix where the data for this element begins.
Generation:	Program MULDIS of the stress processor.	

ELEMENT FORCE MATRIX

File: STRERNF

Index Name: FØ001ba, FØ002ba, ..., FØ999ba

Type: MIXED

Dimensions: N * 1 where N = M*(NLC+1), NLC is the number of loadcases for which forces are calculated. M is the number of forces per loadcase that are present in this partition. (N ≤ 3150)

Auxiliary ID:

Word 1:	STRERNF
Word 2:	The matrix index name.
Words 3-10:	Zero

Elements: Forces and runcodes are stored in blocks relating to internal element numbering. Each block of data has all the force and runcode information for one element. The order of data within such a block is as follows:

Words 1 to NF where NF is the number of kinematic freedoms for the element.

Bits 59-30: Internal node number

Bits 29-0: Freedom number

Words NF+1 to NF+(NF*NLC)

Force for loadcase 1 corresponding to 1st freedom
Force for loadcase 2 corresponding to 1st freedom

•
•
•

Force for loadcase NLC corresponding to 1st freedom
Force for loadcase 1 corresponding to 2nd freedom

•
•
•

Force for loadcase NLC corresponding to freedom NF

Generation: Program MULDIS of the stress processor.

FLEXIBLE ELEMENT CONTROL MATRIX

File:	STRERNF
Index Name:	KECØMAa
Type:	MIXED
Dimensions	M*1 where M is equal to the number of flexible elements matrices on STRERNF.
Auxiliary ID:	Word 1: STRERNF Word 2: KECØMAa Words 3-10: Zero
Elements:	Row i contains the first word of the flexible element data matrix i.
Generation:	Program UORDER of the stress processor.

FLEXIBLE ELEMENT MATRICES (KSF-MATRICES IN USER ORDER)

File: STRERNF

Index Name: KSF001a, KSF002a, ..., KSF999a.

Type: MIXED

Dimensions: M * 1 where M is currently not greater than 2500, initially 2500 words are reserved for each partition. When there is not enough room for the next element, or there are no more elements, its dimension is reduced to the actual number of words used.

Auxiliary ID:

Word 1:	STRERNF
Word 2:	The matrix index name.
Words 3-10:	Zero

Elements:

Item 1:

Bits 59-30:	Reserved for future use
Bits 29-15:	NF, number of elements contained in this matrix (integer)
Bits 14-0:	NBEG, internal number of first element in this partition (integer)

Item 2-NF+1:

Bits 59-54:	EG, the element code (integer)
Bits 53-47:	NOD, the number of nodes (integer)
Bits 46-39:	Reserved for future use
Bits 38-30:	NTOT, total number of words in element data body (integer)
Bits 29-15:	ULABEL, The element user number (integer)
Bits 14-0:	POINT, pointer to the body of element data (integer)

Item NF+2-M: Additional description of the elements, (bodies of element data). The pointer word contains the following packed integers.

Bits 59-54: PC, number of properties (integer)

Bits 53-48: PP, property pointer, 0 if no properties (integer)

Bits 47-39: Element property summary

The element property summary is zero except for the following elements:

BEAM:	Bit 46:	1 if IY > 0 0 if IY = 0
	Bit 45:	1 if IZ > 0 0 if IZ = 0
SPAR:	Bit 46:	1 if T-Web > 0 0 if T-Web = 0
COVER:	Bit 46:	1 if upper surface present 0 if no upper surface
	Bit 45:	1 if lower surface present 0 if no lower surface
CPLATE:	Bits 47-44:	Number of laminae
CCOVER:	Bits 47-44:	Number of laminae in upper plate
	Bits 43-39:	Number of laminae in lower plate

Bits 38-24: RECORD, the LODAREC input record number in which stiffness for this element was input (integer)

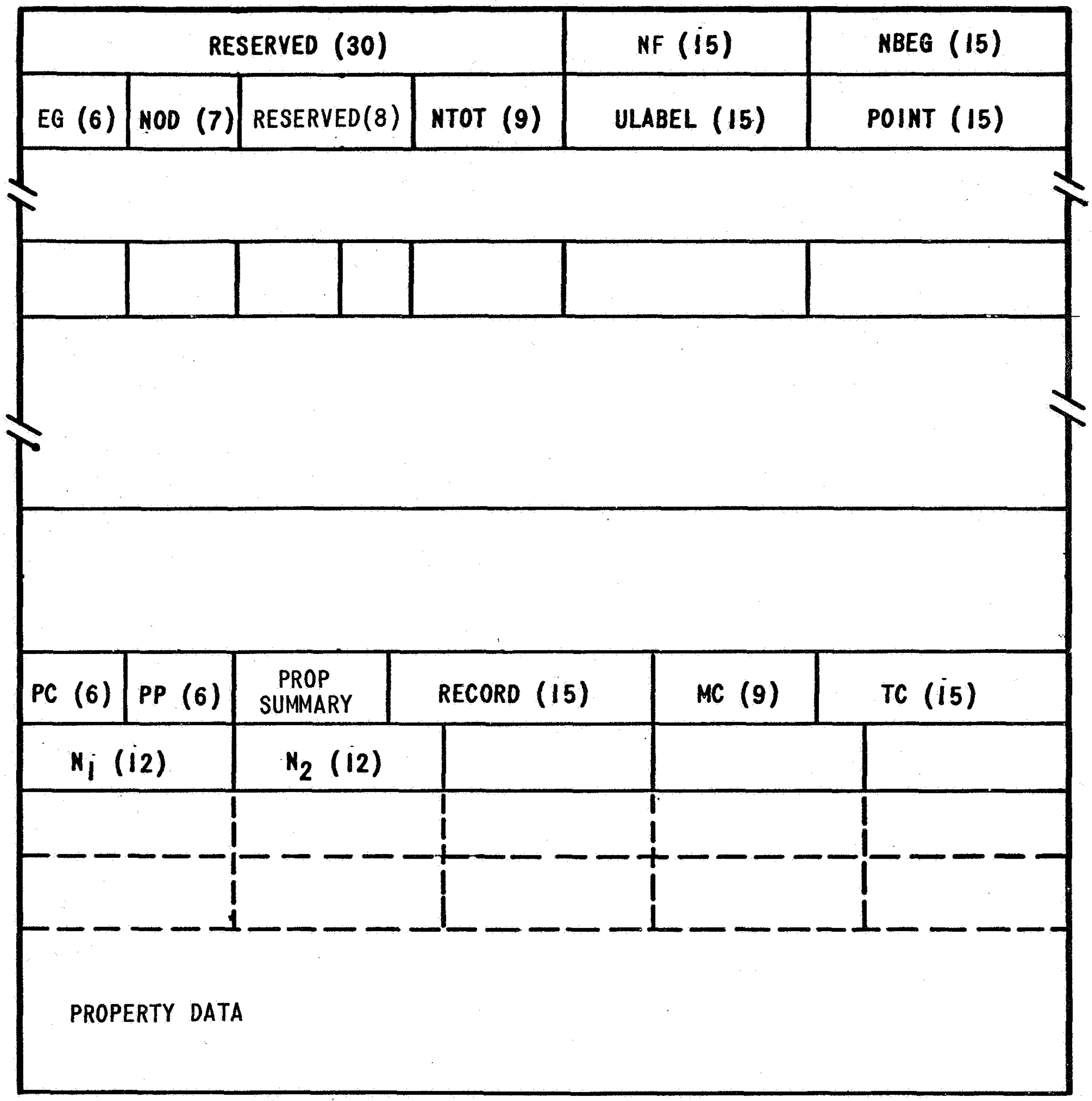
Bits 23-15: MC, the material code. If greater than 400B, material is MC-400B but has zero weight (integer), if zero the material is a composite.

Bits 14-0: TC, the element temperature +10000 in degrees Fahrenheit (integer)

The word following the pointer word is the first word of the element nodal data. The nodes (internal node numbers) are packed as 12 bit integers, 5 to a word, into this and the following words. The nodes are stored left to right with zero right fill. The number of nodal data words is thus (NOD+4)/5. There is at least one node and at most 127 nodes per element. If there are property data, PC is non-zero and the properties are stored in floating point form, one to a word directly following the nodal data. The property pointer PP is the relative address of the first property (PP+POINT).

A schematic picture of a flexible element matrix is shown below.

<u>Generation</u>: Program UORDER of the stress processor.


RESERVED (30)
NF (15)
NBEG (15)
EG (6)
NOD (7)
RESERVED(8)
NTOT (9)
ULABEL (15)
POINT (15)
PC (6)
PP (6)
PROP SUMMARY
RECORD (15)
MC (9)
TC (15)
N1 (12)
N2 (12)
PROPERTY DATA

STRESS CONTROL MATRIX

File: STRERNF

Index Name: SCN01ba, SCN02ba,..., SCN99ba

Type: MIXED

Dimensions: N*1 where N equals the number of elements. If there are more than 2000 elements, each partition is limited to 2000 words.

Auxiliary ID:

Word 1:	STRERNF
Word 2:	The matrix index name
Word 3:	Number of loadcases for which stresses are calculated
Words 4-10:	Zero

Elements: A typical item contains information for one element.

Item i: Contains information for internal element i

Bits 59-36:	Not used
Bits 35-24:	Number of stresses for this element
Bits 23-14:	Partition number of the ST001ba matrix containing the stress for this element.
Bits 13-0:	Position within the ST001ba partition for the start of the stresses for this element.

Generation: Program STRESS of the stress processor.

STRESS ELEMENT SORTING INDEX TABLE

File:	STRERNF
Index Name:	SELSITa
Type:	MIXED
Dimensions:	N*1 where N equals the number of elements
Auxiliary ID:	Word 1: STRERNF Word 2: SELSITa Words 3-10: Zero
Elements:	Item i contains the user order sequence number for internal element i.
Generation:	Program UORDER of the stress processor.

STRESS LOADCASE SPECIFICATION TABLE

File:	STRERNF
Index Name:	SLCSTba
Type:	MIXED
Dimensions:	N*1 where N equals the number of loadcases specified in the last execute stress command.
Auxiliary ID:	Word 1: STRERNF Word 2: SLCSTba Words 3-10: Zero
Elements:	Items 1 through N contain the internal loadcase numbers in increasing order as derived from the execute stress command.
Generation:	Program SETPARS of the stress processor.

STRESS MATRICES

File: STRERNF

Index Name: ST001ba, ST002ba, ..., ST999ba

Type: REAL

Dimensions: M*1 where M equals N*NLC; NLC is the number of loadcases specified by the user in the execute stress parameters and N is the total number of stresses in this partition.

Auxiliary ID:

Word 1:	STRERNF
Word 2:	The matrix index name
Words 3-10:	Zero

Elements: The stresses for element i are stored as follows: (The stresses for one or more elements are fully contained in one partition)

Stress 1 for loadcase 1
Stress 2 for loadcase 1
•
•
•
Stress K for loadcase 1
Stress 1 for loadcase 2
•
•
•
Stress K for loadcase NLC

where K is the number of stresses for element i and NLC is the number of loadcases.

The total set of element stresses are stored in internal element order.

Generation: Program STRESS of the stress processor.

STRESS USER ELEMENT CORRESPONDENCE TABLE

File:	STRERNF
Index Name:	SUELCTa
Type:	MIXED
Dimensions:	N * 1 where N = number of elements
Auxiliary ID:	Word 1: STRERNF Word 2: SUELCTa Words 3-10: Zero
Elements:	Element i has the user element number corresponding to internal element number i.
Generation:	UORDER program of the stress module

SUPERPOSITION STAGE DATA

File:	STRERNF	
Index Name:	SUPERba	
Type:	MIXED	
Dimensions:	N * 1, where $N = 1 + \sum_{k=1}^{NSTA} (1 \quad +3*NLk)$	
	NSTA = the number of component stages, NLK = the number of superposition load cases containing stage NSTk	
Auxiliary ID:	Word 1:	STRERNF
	Word 2:	SUPERba
	Words 3-10:	Zero

Elements:

Item 1:	Bits 59-50:	Represents ingredient stages. The stage positions are numbered 1 thru 10 from left to right. On bits indicate stages referenced in this supstage.
	Bits 49-16:	Reserved.
	Bits 15-12:	Number of ingredient stages, NSTk.
	Bits 11-0:	Total number of superposition loadcases to create.
Item 2-(NSTA+1):		
	Bits 59-54;	Ingredient stage number NSTk
	Bits 53-27:	Reserved
	Bits 26-15:	Number of superposition loadcases containing stage NSTk , NLST
	Bits 14-0:	Pointer to data

Item NSTA+2:

Internal superposition load case number (integer)

Item NSTA+3:

Ingredient internal loadcase number (integer)

Item NSTA+4-N:

Load factor (real)

The last three items are repeated for each loadcase for every stage.

Generation: Program SUPRFAC of the stress module

DISPLACEMENT MATRIX (user order)

File: STRERNF

Index Name: UD001ba, UD002ba, ..., UD999ba

Type: REAL

Dimensions: M * 1 where M = N*NLC, NLC is the number of loadcases and N is the number of active nodal displacements per loadcase that are present in this partition. ($M \leq 3150$)

Auxiliary ID:

Word 1:	STRERNF
Word 2:	The matrix index name
Words 3-10:	Zero

Elements: The displacements for each node are stored in groups in user node number order as shown below. (The displacements for one or more modes are fully contained in one partition.)

Displacement of freedom 1 for loadcase 1
Displacement of freedom 1 for loadcase 2
•
•
•
Displacement of freedom 1 for loadcase NLC
Displacement of freedom 2 for loadcase 1
•
•
•
Displacement of freedom K for loadcase NLC

(K is the number of active freedoms for this node)

Generation: Program UORDER of the stress processor.

NODAL DISPLACEMENT CONTROL MATRIX (USER ORDER)

File:	STRERNF
Index Name:	UDC01ba
Type:	MIXED
Dimensions:	N * 1 where N equals the number of nodes with active freedoms.

Auxiliary ID:

Word 1:	STRERNF
Word 2:	UDC01ba
Word 3:	Number of loadcases
Word 4:	Logical OR of all freedom activity bit patterns
Words 5-10:	Zero

Elements: Each item contains the following data for one node. The data is ordered in increasing user number order.

Bits 59-45:	Internal node number.
Bits 44-30:	Binary code describing which freedoms are active for this node.
Bits 29-15:	Partition number of the UD001ba matrix containing the displacement data for the node.
Bits 14-0:	Position within the UD001ba partition of the start of the displacement data for this node.

Generation: Program UORDER of the stress processor.

ELEMENT FORCE MATRIX (USER ORDER)

File:	STRERNF
Index Name:	UF001ba, UF002ba, ..., UF999ba
Type:	MIXED
Dimensions:	N * 1 where N = M*(NLC+1). NLC is the number of loadcases for which forces are calculated. M is the number of forces per loadcase that are present in this partition. (N $\leq$ 3150)
Auxiliary ID:	Word 1: STRERNF Word 2: The matrix index name. Words 3-10: Zero

Elements:

Forces and runcodes are stored in blocks relating to user element numbering. Each block of data has all the forces and runcode information for one element. The order of data within such a block is as follows:

Words 1 to NF where NF is the number of kinematic freedoms for the element.

Bits 59-30: Internal node number

Bits 29-0: Freedom number

Words NF+1 to NF+(NF*NLC)

Force for loadcase 1 corrosponding to 1st freedom
Force for loadcase 2 corresponding to 1st freedom

•
•
•

Force for loadcase NLC corresponding to 1st freedom
Force for loadcase 1 corresponding to 2nd freedom

•
•
•

Force for loadcase NLC corresponding to freedom NF

Generation: Program UORDER of the stress processor.

FORCE CONTROL MATRIX (USER ORDER)

File:	STRERNF	
Index Name:	UFC01ba	
Type:	MIXED	
Dimensions:	N * 1 where N equals the number of elements	
Auxiliary ID:	Word 1:	STRERNF
	Word 2:	UFC01ba
	Word 3:	Number of loadcases for which we have forces.
	Words 4-10:	Zero
Elements:	Word j has data for the jth element in user order.	
	Bits 59-45:	Not used
	Bits 44-30:	Number of kinematic freedoms for this element
	Bits 29-15:	Partition number of the UF001ba matrix containing data for this element
	Bits 14-0:	Position within the UF001ba matrix where the data for this element begins.
Generation:	Program UORDER of the stress processor.	

STRESS MATRICES - USER ORDER

File: STRERNF

Index Name: US001ba, US002ba, ..., US999ba

Type: REAL

Dimensions: M*1 where M equals N*NLC; NLC is the number of loadcases specified by the user in the execute stress parameters and N is the total number of stresses in this partition.

Auxiliary ID:

Word 1:	STRERNF
Word 2:	The matrix index name
Words 3-10:	Zero

Elements: The stresses for element i are stored as follows; (The stresses for one or more elements are fully contained in one partition)

Stress 1 for loadcase 1
Stress 2 for loadcase 1
•
•
•
Stress K for loadcase 1
Stress 1 for loadcase 2
•
•
•

Stress K for loadcase NLC

Where K is the number of stresses for element i and NLC is the number of loadcases.

The total set of element stresses are stored in user element order.

Generation: Program UORDER OF THE STRESS PROCESSOR.

STRESS CONTROL MATRIX - USER ORDER

File:	STRERNF	
Index Name:	USC01ba, USC02ba, ..., USC99ba	
Type:	MIXED	
Dimensions:	N*1 where N equals the number of elements. If there are more than 2000 elements, each partition is limited to 2000 words.	
Auxiliary ID:	Word 1:	STRERNF
	Word 2:	The matrix index name
	Word 3:	Number of loadcases for which stresses are calculated
	Words 4-10:	Zero
Elements:	A typical item contains information for one element.	
Item i:	Contains information for the i-th element when stored in user ID order.	
	Bits 59-36:	Not used
	Bits 35-24:	Number of stresses for this element
	Bits 23-14:	Partition number of the US001ba matrix containing the stress for this element
	Bits 13-0:	Position within the US001ba partition for the start of the stresses for this element
Generation:	Program UORDER of the stress processor.	

VIBRATION EIGENVALUES

File:	VIBRRNF	
Index Name:	FREQSvs (user matrix)	
Type:	MIXED	
Dimensions:	(NF*3)*1, where NF equals the number of frequencies requested	
Matrix Name:	Word 1:	Date of matrix generation (month/day/year)
	Word 2:	Mass matrix name
	Word 3:	Stiffness matrix name
	Word 4:	Eigenvalues matrix name
	Word 5:	Generalized mass matrix name
	Word 6:	Generalized stiffness matrix name
Auxiliary ID:	Word 1:	VIBRRNF
	Word 2:	The matrix index name
	Words 3:	Type of dynamic matrix operated on. = 1 - stiffness = 2 - Flexibility = 3 - Buckling
	Words 4-10:	Zero
Elements:	The eigenvalues are stored in a row-wise, lower triangluar format. (Sparse format, no leading zeros)	
Generation:	Program EXPAND of the vibration processor.	

GENERALIZED MASS

File:	VIBRRNF
Index Name:	GMASSvs (user matrix)
Type:	REAL
Dimensions:	M*M, where M equals the number of requested mode shapes
Auxiliary ID:	Word 1: VIBRRNF Word 2: The matrix index name Word 3: Number of normalizing factors from R.B.M. Words 4-9: Normalizing factors from R.B.M. Word 10: Zero
Elements:	Square symmetric generalized mass matrix where each row i or column i contains the generalized mass for the i-th mode.
Generation:	Program EXPAND of the vibration processor.

GENERALIZED STIFFNESS

File:	VIBRRNF
Index Name:	GSTIFvs (user matrix)
Type:	REAL
Dimensions:	M*M where M equals the number of requested mode shapes.
Auxiliary ID:	Word 1: VIBRRNF Word 2: The matrix index name Words 3-10: Zero
Elements:	Square symmetric generalized stiffness matrix where each row i or column i contains the generalized stiffness for the i-th mode.
Generation:	Program EXPAND of the vibration processor.

VIBRATION EIGENVECTORS (MODE SHAPES)

File:	VIBRRNF	
Index Name:	MODESvs (user matrix)	
Type:	REAL	
Dimensions:	N*M where N equals the dimension of the stiffness matrix (number of retained degrees of freedom) and M equals the number of requested mode shapes.	
Matrix Name:	Word 1:	Date of matrix generation (month/day/year)
	Word 2:	Mass matrix name
	Word 3:	Stiffness matrix name
	Word 4:	Eigenvalues matrix name
	Word 5:	Generalized mass matrix name
	Word 6:	Generalized stiffness matrix name
Auxiliary ID:	Word 1:	VIBRRNF
	Word 2:	The matrix index name
	Word 3:	Number of normalizing factors for rigid body modes
	Words 4-9:	The normalizing factors
	Word 10:	Zero
Elements:	Item (i,j) contains the normalized displacement of the j-th freedom for the i-th mode.	
Generation:	Program EQCHECK of the vibration processor.	

SUBSET FREEDOM AND NODE NUMBERS (ASSOCIATED WITH SUBSET MODE SHAPES)

File:	VIBRRNF	
Index Name:	SFdddvs	
Type:	MIXED	
Dimensions:	NS*1, where NS is the number of retained degrees of freedom associated with its nodal subset	
Matrix Name:	Word 1:	Date of matrix generation (month/day/year)
	Word 2:	Mass matrix name
	Word 3:	Stiffness matrix name
	Word 4:	Eigenvalues matrix name
	Word 5:	Generalized mass matrix name
	Word 6:	Generalized stiffness matrix name
Auxiliary ID:	Word 1:	VIBRRNF
	Word 2:	SFdddvs
	Words 3-10:	Zero

Elements: Item i is associated with the i-th retained freedom. This item contains two packed 30 bit integers as follows:

Bits 59-30: The freedom number for this retained freedom

Freedom Number	Freedom
1	x-translation
2	y-translation
3	z-translation
4	x-rotation
5	y-rotation
6	z-rotation

Bits 29-0: The user node number for this retained freedom.

Generation: Program PSUBSET of the vibration processor.

MODE SHAPES (ASSOCIATED WITH NODAL SUBSETS)

File:	VIBRRNF	
Index Name:	SMdddvs (user matrix)	
Type:	REAL	
Dimensions:	NS*M, where NS is the number of retained degrees of freedom associated with its nodal subset and M equals the number of requested mode shapes.	
Matrix Name:	Word 1:	Date of matrix generation (month/day/year)
	Word 2:	Mass matrix name
	Word 3:	Stiffness matrix name
	Word 4:	Eigenvalues matrix name
	Word 5:	Generalized mass matrix name
	Word 6:	Generalized stiffness matrix name
Auxiliary ID:	Word 1:	VIBRRNF
	Word 2:	SMdddvs
	Words 3-10:	Zero
Elements:	Item (i,j) contains the normalized displacement of the j-th freedom for the i-th mode.	
Generation:	Program PSUBSET of the vibration processor.	

TOTAL MASS MATRIX

File: VIBRRNF

Index Name: TOTWTvs (user matrix)

Type: REAL

Dimension: 6*6

Auxiliary ID:

Word 1:	VIBRRNF
Word 2:	The matrix index name
Words 3-10:	Zero

Elements: Total mass and inertias positioned as follows:

$$
\begin{bmatrix}
W & 0 & 0 & 0 & 0 & 0 \\
0 & W & 0 & 0 & 0 & 0 \\
0 & 0 & W & 0 & 0 & 0 \\
0 & 0 & 0 & Ixx & Ixy & Ixz \\
0 & 0 & 0 & Ixx & Iyy & Iyz \\
0 & 0 & 0 & Izx & Izy & Izz
\end{bmatrix}
$$

Generation: Program RIGIDBM of the vibration processor.

VIBRATION SET CONDITION MATRIX

File:	VIBRRNF
Index Name:	VSETCON
TYPE:	MIXED
Dimension:	NVSET * 3, where NVSET is the maximum number of vibration sets.
Auxiliary ID:	Word 1: VIBRRNF Word 2: VSETCON Words 3-10: Zero
Elements:	Row i contains the following data for vibration set number i.
Item 1:	Bits 59-30: Set number Bits 29-0: Stage number
Item 2:	Stiffness or Flexiblity matrix name.
Item 3:	Mass matrix name.
Generation:	Program PICKUP of the vibration processor.

APPENDIX A - BIT NUMBERING CONVENTION

The bit references in the matrix descriptions are based on a 60 bit word numbered left to right as indicated below.

59 0

60 BIT WORD

APPENDIX B - MATRIX USAGE

ADDINT Processor:

Input

1	ACMij00
2	GFØijkl

Output

1	xxxxx	Data case control
2	xxxxxyy	Generalized airforce matrix

AF1 processor

Input

1	AFCCi
2	AFCFi
3	AFCGi
4	AFCSi
5	AFMCi
6	AFMGi
7	AFSLi
8	AFPMi
9	AFRBi
10	AFTCi
11	AFTGi
12	AFURi
13	AFYGi
14	Cddd
15	INTABLE

Output

1	ACMij
2	CAyijAl
3	CGCij
4	CTCij
5	GF0ijAl
6	M1Cij

7	M2Cij
8	SIØij
9	SAyijAl
10	TGCij
11	Wxxij
12	XMØij

BUCKLING Processor

<u>Input</u>

1	xxxxxxx Geometric stiffness matrix
2	KRFV0ba
3	KNØALTa
4	KNC100a
5	KLØCØØa

<u>Output</u>

1	BSETCØN
2	EIGENbs
3	MØDESbs

DESIGN Processor

<u>Input</u>

1	NALLØWC
2	NALLØWS
3	NBI001a
4	NBUCTAB
5	NC001ba
6	NDLCRba
7	NDP001a
8	ND001ba
9	NITYPEa
10	NKS001a
11	NI001ba
12	NMATERa
13	NMS001a
14	NØCNTRa
15	NØDVCCa
16	NØD001a

17	NPARAMa
18	NPB001a
19	NPD001a
20	NSMCNTa
21	NSMKEYa
22	NSP001a
23	NST001a
24	NVARIAa
25	LCØØRba
26	KPARMS1
27	KSF001a
28	KM00001
29	SEKddda
30	SCN01ba
31	SLCSTba
32	ST001ba

<u>Output</u>

1	DESPARa
2	HISTRYa
3	KSF001a
4	MIN01ca
5	MPARcba
6	MPØ001a
7	MTARcba
8	M001cba
9	N001cba
10	S001cba
11	SMIMcba
12	TMIMcba
13	T001cba

DUBLAT Processor

<u>Input</u>

1	DLCSi
2	DLPGi
3	DLBGi
4	DLDIi
5	DLVIi
6	DLPIi
7	DLMCi
8	DLRBi

9	DISSi
10	Cddd
11	INTABLE

Output

1	B1Cij00
2	B2Cij00
3	ACMij00
4	DBCij00
5	GF0ijkl
6	M1Øij00
7	M3Øij00
8	PDØijkl
9	PSCij00
10	Q00xxkl
11	SBCij00
12	SDØijkl
13	SFBijkl
14	SFØijkl
15	SGCij00
16	VPCij00

EXTRACT processor

Input

1	ADATDIR
2	BSETCØN
3	CVEC01a
4	DCNTRba
5	DCØØRba
6	DIØØ1ba
7	EIGEN01
8	FPijklm
9	FPijklmn
10	FREQS01
11	FVEC01a
12	KLØCØØa
13	KMELNØa
14	KNC100a
15	KNØALTa
16	KPRAMS1
17	KRFV0ba
18	KSF001a

19	KUFRT0a
20	MØDES01
21	MPARMS1
22	MØØ1cba
23	NØØ1cba
24	PVEC01a
25	SCN01ba
26	SDTNLST
27	SEKddda
28	SEMddda
29	SFddd01
30	SITM001
31	SLCSTba
32	SMddd01
33	SNKddda
34	SPKddda
35	ST001ba
36	TAPLWTa
37	TØTLWTa
38	VSETCØN

<u>Output</u>

1	ADATDIR
2	DBEXCØN
3	DBEXTNM
4	DBINDEX
5	DB001XX
6	DBINDXX
7	ALNMLST
8	ALNM001
9	CANMLST
10	CANM001
11	CSNMLST
12	CSNM001
13	CØNMLST
14	CØNM001
15	CYNMLST
16	CYNM001
17	LCNMLST
18	LCNM001
19	MDNMLST
20	MDNM001
21	RSNMLST

22	RSNM001
23	SUBSLST
24	SPKddda
25	SDINLST
26	SITM001

FLEXAIR Processor

<u>Input</u>

1	xxxxxxx	Stiffness or Flexibility matrix
2	xxxxxxx	Mass matrix
3	MØDESvs	
4	GSTIFvs	
5	SMdddvs	
6	ACMij00	
7	GFOijkl	

<u>Output</u>

1	xxxxx	Data case control
2	xxxxxyy	Generalized airforce matrix

FLUTTER Processor

<u>Input</u>

1	ULCSi	
2	xxxxx	Data case control
3	xxxxxyy	Generalized Airforce Matrix
4	GMASSvs	Generalized Mass
5	GSTIFvs	Generalized Stiffness

<u>Output</u>

1	FRiupvj
2	FPiupvj
3	FLBCij
4	Fiupvjw

INTERPOLATION Processor

Input	
1	SMdddvs
2	KNØALTa
3	KNC100a
4	KLØCØØa
5	SNKddda
6	SFdddvs

Output	
1	Cddd0
2	INTABLE

LCADS Processor

Input	
1	LCØØRba
2	LN001ba
3	LE001ba
4	LT001ba
5	LTLCCba
6	LNTLTba
7	LEDIRba
8	LD001ba
9	LCØMBba
10	KCØØRba
11	KD001ba
12	KLCT001
13	KSF001a
14	KNC100a
15	KNØALTa
16	KLØCØØa
17	KMELNØa
18	LRØTNba
19	LU000ba
20	GKS001a
21	GP0001a
22	KA0001a
23	MA0001a

Output

1	RSULTba
2	LA001ba
3	DCØØRba
4	ISC01ba
5	IS001ba
6	DA001ba
7	ELCØNba
8	ELØØØba
9	LFAV0ba
10	IB001ba
11	IBC01ba

MACHBOX Processor

Input

1	BOXi
2	Cddd

Input/Output

1	AICCeee
2	AICØINDX
3	AICMeee
4	AICPeee
5	AICWeee
6	AICVeee

Output

1	ACMij
2	ACNijkl
3	BLnijkl
4	BØXijkT
5	BØXijkW
6	CMnijkl
7	DWPijkl
8	EXPij
9	GACijkl
10	GCIijkl
11	GF0ijkl
12	ISPijk
13	LNnijkl

14	LTnijkl
15	MØnijkl
16	MPTijk
17	PCnijkl
18	PSTijkl
19	PSWijkl
20	SACijkl
21	SBnijkl
22	SCIijkl
23	SF0ijkl
24	SLnijkl
25	SMnijkl
26	SPnijkl
27	SSnijkl
28	STnijkl
29	SUnijkl
30	SVnijkl
31	UNnijkl
32	UTnijkl
33	VPnijkl
34	WSnijkl

MASS Processor

<u>Input</u>

1	ISSCsss
2	ISSSCØR
3	KLØCØØa
4	KM00001
5	KMELNØa
6	KNC100a
7	KNØALTa
8	KPARMS1
9	KRFV0ba
10	KSF001a
11	MCMASga
12	MCMNØDa
13	MCØNDTa
14	MFATUDa
15	MFCØNDa
16	MFLØADa
17	MFMUSEa
18	MFULffa
19	MHØLDSa

20	MLØDppa
21	MMELNØa
22	MLUMP0a
23	MPANLha
24	MPARMS1
25	MPCØNDa
26	MPLØADa
27	MPLØCLa
28	MPNØCTa
29	MPNØDMa
30	MPSETha
31	MSF001a
32	MTANKSa
33	MWTFACa
34	MWTFTta
35	SEKddda
36	SEMddda

<u>Output</u>

1	MA0001a
2	Cg0001a
3	M------
4	G------
5	ID-----
6	TØTLWTa
7	TAPLWTa
8	MDCqqqa
9	MREDsss
10	MFAV00a
11	FTtt01a
12	FTINDXa
13	FVECffa
14	CVECppa
15	PVECppa

MERGE Utility Processor

Set/Stage Option

<u>Input</u>

1	KACV0ba
2	KFAV01a
3	KRFV0ba
4	KUFRT0a

5	KFAT00a
6	KNC100a
7	LFAV0ba
8	MFAV00a
9	DCØØba
10	KA0001a
11	MA0001a
12	Cg0001a
13	DA001ba
14	LA001ba
15	KNØDCØN
16	BSETCØN

<u>Output</u>

1	KUFRT0a
2	KFAT00a
3	KRTC0ba

Substructure Option

<u>Input</u>

1	ICAVsss
2	IRFVsss
3	IRTCsss
4	IFATsss
5	IFAVsss
6	IUFRsss
7	INC1sss
8	ILFAsss
9	ILCØsss
10	ILRCsss
11	LSRCsss
12	INDMsss
13	IDLCsss
14	IELCsss
15	LA001ba
16	DA001ba

<u>Output</u>

1	IFATsss
2	IUFRsss
3	IRTCsss

RHO3 Processor

<u>Input</u>

1	R30i000
2	RCmi000

<u>Input/Output</u>

1	CM00000
2	CMi0000

<u>Output</u>

1	ACMij00
2	DW0ijkl
3	DWMijkl
4	GF0ijkl
5	HCmij00
6	MØ0ij00
7	PR0ijkl
8	PS0ijkl
9	R30ij00
10	SFmijkl

STIFFNESS Processor

<u>Input</u>

1	KPARMS1
2	KNØALTa
3	KNC100a
4	KLØCØØa
5	KSF001a
6	KM00001
7	ST001ba
8	KELEKEY
9	KCMSUMM
10	DCØØRba

Output

1	KA0001a
2	GP0001a
3	KFAV01a
4	KG0001s
5	IFAVsss
6	GFAV01s

STRESS Processor

Input

1	KPARMS1
2	KRFV0ba
3	KFAT0ba
4	KLCT00a
5	ISSCsss
6	ISSSCØR
7	KSF001a
8	GP0001a
9	ISC01ba
10	IS001ba
11	DCØØRba
12	ILCLsss
13	SULCTba
14	IFATsss
15	IRFVsss
16	KA0001a
17	SUPERba
18	SUPSTGa
19	SUDISba
20	SUSTRba

Output

1	SLCSTba
2	DCNTRba
3	DI001ba
4	SCN01ba
5	ST001ba
6	SUELCTa
7	SELSITa
8	KECØMAa
9	KSF001a

10	US001ba
11	USC01ba
12	DCØØRba
13	FCNTRba
14	FØ001ba
15	UFC01ba
16	UF001ba
17	UDC01ba
18	UD001ba
19	SUPERba

VIBRATION Processor

<u>Input</u>

1	xxxxxxx	Mass Matrix
2	xxxxxxx	Stiffness/Flexibility Matrix
3	SNKddda	
4	KRFV0ba	
5	KNØALTa	
6	KNC100a	
7	TAPLWTa	
8	KLØCØØa	

<u>Output</u>

1	FREQSvs
2	MØDESvs
3	SMdddvs
4	GMASSvs
5	GSTIFvs
6	TØTWTvs
7	SFdddvs
8	VSETCØN

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16. Abstract

A complete catalog of the random access files used by the ATLAS integrated structural analysis and design system is presented in this document. ATLAS is comprised of a number of technical computational modules which output data matrices to corresponding random access files. Each of the data matrices written on these files is described in detail.

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